MAC mini iH Series

MAC mini iH / iHF / iHP
MAC mini iH2 / iHT

User's Manual

Configuration of user's manual

The user's manual consists of the following items.

- ➢ Operation Manual
- ➢ Parameter　Expansion Manual
- ➢ Maintenance Manual
- ➢ Connection Manual
- ➢ Parts List

Carefully understand conditions such as product specifications, usage limit, etc., before using products.

FOR SAFE OPERATION

This manual is described to help you get the best use from your MAC mini iH series. Improper handling can cause unexpected accidents or damage, therefore read this manual carefully and thoroughly before using the equipment.

Keep this manual handy for easy reference as it will help you use many controls to their full advantage.

F O R   Y O U R   S A F E T Y

Before using the equipment, carefully read this instruction manual and familiarize yourself with the equipment and all safety precautions. Safety precautions in this manual are divided into the following two types.

⚠	Indicates an imminently hazardous situation which will result in death or serious injury if proper safety procedures and instructions are not adhered to.
⚠ CAUTION	Indicates a potentially hazardous situation which may result in minor or moderate injury if proper safety procedures and instructions are not adhered to.

There is a possibility that serious accident will be caused by the situation even items described for CAUTION, therefore, be sure to observe contents carefully.

Reference

➢ Each manual can't be mentioned about all terms of use though it was intended to be mentioned for the details. In thing not mentioned, consider that it is "IMPOSSIBLE".

➢ Please understand that the manual may be changed without prior notice because of machine modification, specification change, etc.

1.   To Prevent Electric Shock

⚠	◆ Do not open the cover because any electric shock will be caused. (High voltage terminals and live parts are exposed in the controller and live parts are remained even if the main power is turned OFF.) ◆ Check the voltage with the tester, etc., after the power is turned OFF before performing wiring work and inspection because the electric shock will be caused. ◆ Perform the grounding work of Class D (Class No. 3). ◆ Only qualified persons shall perform the wiring work and inspection. ◆ Never touch the equipment with wet hands because the electric shock will be caused. ◆ Do not damage, pull cables forcedly, ride heavy thing on cables, and also do not pinch the cables because the electric shock will be caused Because electric shock, burning and unexpected motion of machine will be caused. ◆ After power is turned OFF, never touch the terminal for 5 minutes because there is a possibility to get an electric shock through residual voltage.

2.   To Prevent Fire

⚠ CAUTION	◆ Install the MAC mini iH away from flammables. If the machine will be installed on flammables directly or near it, fire will be caused. ◆ If the controller fails, turn OFF power because fire occurs if over-current flows continuously.

3.   To Prevent Damage

⚠ CAUTION	◆ Do not touch the movable parts of machine during operation. ◆ Apply only voltage specified in this manual to each terminal. Improper voltage will cause the equipment damage. ◆ Do not connect terminal in mistake because the machine will be broken or damaged. ◆ Do not touch the fan and other parts of the MAC mini iH because they become high temperature while the equipment is charged and shortly after the power is turned OFF.

4. Other Precautions

    Observe the following precautions at all times. Mishandling will cause machine trouble, personal injury and electric shock.

(   ) Transportation and Installation

⚠	◆ Transport the machine and equipment by the ways suited to their weights. ◆ Do not stack the equipment at multistage. ◆ Install the equipment at the floor where it withstands equipment weight and at wide area where operator can work without danger. ◆ Do not climb on the equipment or place any objects on it. ◆ Install the equipment in the specified orientation. ◆ Ensure a specified space between the controller and the inside of control panel or other equipment. Also, arrange the equipment so that external cables are easily routed and space the controller at least 0.2m or more from the floor. ◆ Do not enter the screws, metal pieces of electrically conductive objects or flammable foreign matters of oil, etc., inside of the controller. ◆ Since the controller is the precision equipment, do not drop it or apply any impact shock to the controller. ◆ Install the pendant at place where it will be arranged 0.6m or more from a working floor level that operator stands. Also, install the pendant so that the LCD of pendant can be checked.

(   ) Environment

⚠ CAUTION	◆ Install the main controller in the environment to pollution level 2. ◆ Ensure a specified space between the controller and the inside of control panel or other equipment. ◆ Do not enter the screws, metal pieces of electrically conductive objects or flammable foreign matters of oil, etc., inside of the controller. ◆ Store and use the MAC mini iH under the environment conditions described in the Instruction Manual. Ambient temperature, ambient humidity, storage (transportation) temperature, storage humidity, etc.

(　　) Wiring

| ![CAUTION] | ◆ Install the circuit breaker that is an optimum for the insulation of IEC60947-2. Each rated current for circuit breaker as follows: |

Controller Type	Capacity of Circuit Breaker
MAC mini iHF	5A
MAC mini iH	10A
MAC mini iH2/iHT	15A

◆ Route cables correctly and securely.

◆ Securely connect cables so as not to be loosened into a chain reaction.

When connecting the cables (CB1i cable) to the rotary table, don't bend them forcedly. Also, don't apply stress to cables.

Route cables so that they do not interfere with the machine while the machine is operating.

In case a ground-fault circuit breaker is used, please use that to which 100mA or more of sensed current and time of operation are 0.1 seconds or more, or performed the measure against high frequency for a preventing-incorrect operation by high-frequency of motor sake.
When you cannot perform change of the ground-fault circuit breaker of the present attachment, please supply a power supply by the following method.

A power supply is supplied from a secondary the transformer of a machine side.
When   cannot be carried out, please connect a noise filter to a power supply line.

(　　) Adjustment by Trial Run

| ![CAUTION] | ◆ Check and adjust parameters before operation. The equipment may move unexpectedly if any parameter is incorrect.

◆ Never adjust the parameter extremely because the equipment becomes unstable. |

(　　) Precautions

| ![CAUTION] | ◆ Route an external emergency stop circuit so that the equipment can be stopped immediately.

◆ Do not disassemble and repair the equipment.

◆ Do not modify or remodel the equipment.

◆ Minimize the effect of electromagnetic interference with a noise filter, etc. |

(　　) Countermeasures

| ![CAUTION] | ◆ If an alarm occurs, eliminate the cause and check safety before resetting the alarm, and then restart the equipment. |

Configuration

	Item	Specifications	
1	Controlled axes	MAC mini iH / iHF 1 axis Servo motors 750W / 400W MAC mini iH2 / iHT 2 axis Servomotors 750W+750W / 750W +400W MAC mini iHP 1 axis Servomotors 2KW	
2	Data memory	Backup by EEPROM Writing frequency: 100000 times	
3	Motor capacity	400W / 750W / 2KW	
4	Table I/O	INPUT DC24V 5mA OUTPUT DC24V 0.5A	
5	OUTER INPUT Signals	INPUT DC24V 5mA	

INPUT DC24V 5mA

Input signal name	MAC mini	
	iH / iHF / iHP	iH2 / iHT
CLAMP INPUT 1 (BK.C1)		
UNCLAMP INPUT 1 (BK.UC1)		
OVERRUN INPUT A1 (OVRUNA1)		
OVERRUN INPUT B1 (OVRUNB1)		
CLAMP INPUT 2 (BK.C2)		
UNCLAMP INPUT 2 (BK.UC2)		
OVERRUN INPUT A2 (OVRUNA2)		
OVERRUN INPUT B2 (OVRUNB2)		

OUTPUT DC24V 0.5A

Input signal name	MAC mini	
	iH / iHF / iHP	iH2 / iHT
BRAKE OUTPUT 1 (BK+1 / BK-1)		
BRAKE OUTPUT 2 (BK+2 / BK-2)		

INPUT DC24V 5mA

Input signal name	MAC mini	
	iH / iHF / iHP	iH2 / iHT
START INPUT (ST)		
STOP INPUT (SP)		
OUTER EMG. STOP INPUT (EXTEM)		
CHANNEL SET INPUT (CHSET)		
CHANNEL SELECT INPUT 0 3 (CHSEL0 3)		
OUTER ZEN INPUT 1 (ZRN1)		
OUTER RESET (RST)		
OUTER MODE CHANGE (AUTOSET/MANUALSET)		
OUTER ZRN INPUT 2 (ZRN2)		

6	Outer output signals Dry contact	The power specifications of output circuit are to be within range specified to PELV(Protection ultra-low voltage) and to be the following specifications. 25V ACrms / 30V DC

Input signal name	MAC mini	
	iH / iHF / iHP	iH2 / iHT
Optionally completed OUTPUT 1　　(G99FIN1)		
360 completed OUTPUT 1　　　　　(360FIN1)		
ZRN completed OUTPUT 1　　　　(ZRNFIN1)		
Alarm OUTPUT A,B　　　　　(ALMOUTA,B)		
EMG. STOP OUTPUT　　　　　　(EMOUT)		
Channel No. OUTPUT 0　6　(CHOUT0　6)		
Optionally completed OUTPUT 2　(G99FIN2)		
360 Completed OUTPUT 2　　　　(360FIN2)		
ZRN COMP OUTPUT 2　　　　(ZRNFIN2)		

7	Power INPUT Vol. Voltage fluctuation Frequency INPUT capacity Momentary power interruption Grounding condition	AC200/230V　1　　　　MAC mini iH / iHF / iH2 / iHT AC200/230V　3　　　　MAC mini iHP -10　　　+10 50/60Hz 0.6KVA MAC mini iHF 1.0KVA MAC mini iH 1.6KVA MAC mini iHT 2.0KVA MAC mini iH2 2.5KVA MAC mini iHP 1-cycle or less Class D grounding (Grounding resistance value 100　or less) or more

8	Environment Service temp. Storage temp. (Transp. Temp.) Humidity Vibration proof Shock resistant Atmosphere	0 ～ 45 -10　　～　60 85　RH or less　Condensation or freezing not to be occurred. 0.5G or less 1G or less to pollution level 2.

9	Sizes W×D×H	328.7×305×190mm　　not including convex　MAC mini iH / iHF 398.7×400×250mm　　not including convex　MAC mini iH2 / iHT / iHP

10	Weight	14kg　　MAC mini iH / iHF 24kg　　MAC mini iH2 / iHT /iHP

OPERATION   MANUAL

■   Readers for this manual

Readers for this manual are as follows:

➢   All persons to use controller.

Contents

◆ **Main Body   Pendant**

Main Body of MAC mini iH　Series

Main Body of MAC mini iH2　Series

Pendant of MAC mini iH   Series

KITAGAWA

EMERGENCY
STOP

MODE
- ○ □ AUTO
- ○ ✋ MANUAL
- ○ ✐ EDIT
- ○ ▷ PARAM
- ○ ⬚ SINGLE

STATUS
- ○ RUN
- ○ STOP
- ○ RESET
- ○ ALARM
- ○ READY A
- ○ READY B

START ▽ RESET

A/B

DEL | H | INS
MZERO | VZERO | ORG

MODE
OVR

7_G | 8_A | 9_J
4_D | 5_F | 6_P
1_E | 2_L | 3_N-
0_CH | -_N | N+

CL/DGN
INPUT
CAN
ENT

MAC mini i series
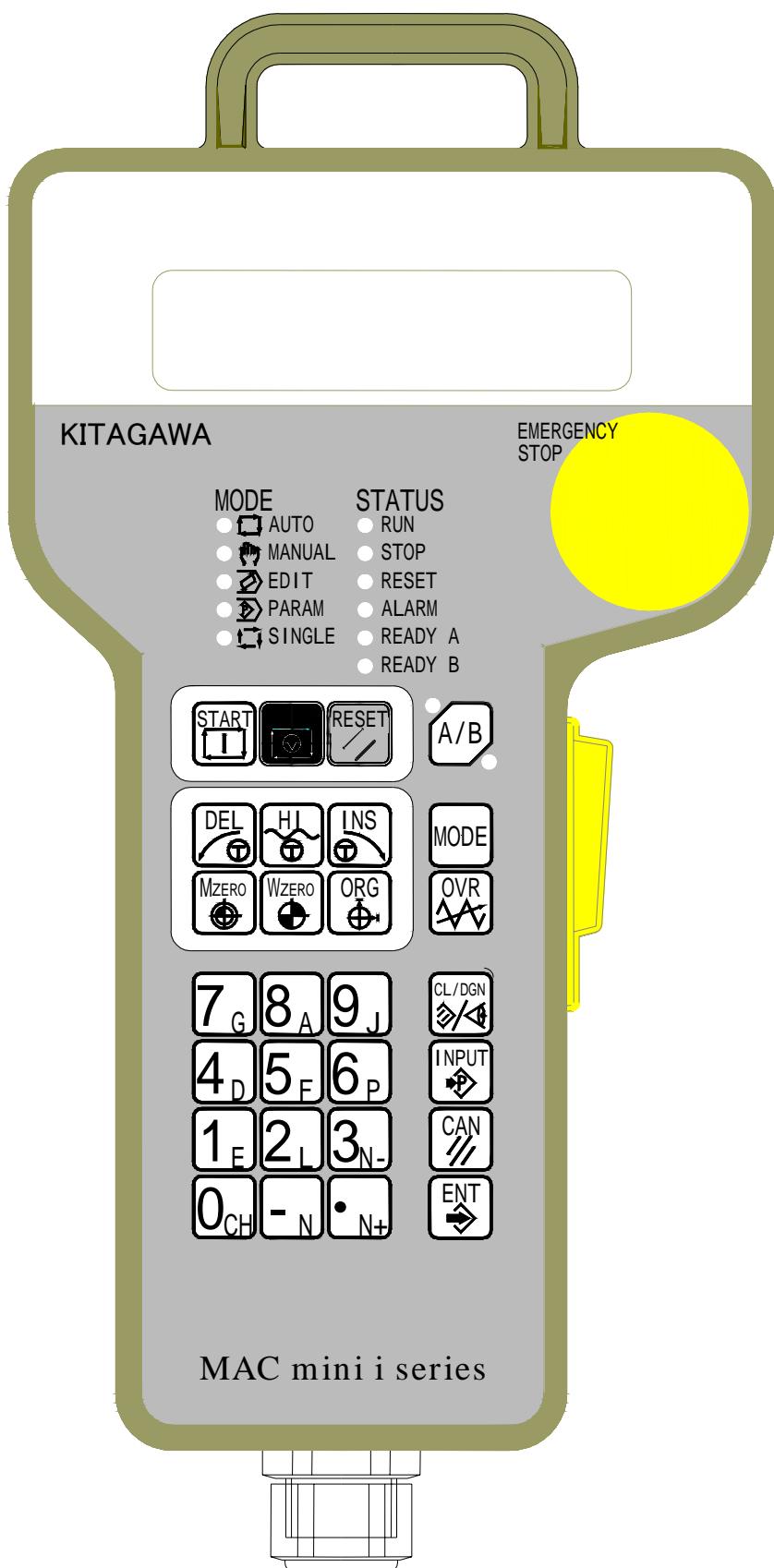
1   Start-up

1.1.   Power ON/OFF

1.1.1.
Power ON

Turn ON the power switch of the controller.

The sum check of control is performed in start-up.

(1.2 See Screen Configuration in Start-up.)

1.1.2.
Power OFF

Turn OFF the power switch of the controller.

Wait for 5 seconds before turning ON the power again.

※   If the power is turned ON again within 5 seconds, any data memory may be

incorrectly stored.

1.2.   Screen Configuration in Start-up

When the controller is started, the information and sum check situation for the controller are displayed on the screen and their contents are as follows:

. Sum check situation of servo parameters

. System information

. EDIT information

1.2.1.
Sum check situation of servo parameters

When the power is turned ON, the system checks that the servo parameter stored into memory in previous power shutoff corresponds to the data set value.

Because the set value varies when the servo amp., inside of controller is changed for maintenance, the system encourages the resetting for servo amp., and also gives warning so as to operate the machine in safety.

<div style="background-color:#c5f041; padding:20px;">

PARAM CHECK

</div>

Check Display for Servo Parameter

When any FAULT occurs by the servo parameter check, the checked number (address) is displayed on the right side of   PARAM CHECK   on the screen.

When nothing is displayed on the right side of   PARAM CHECK   , the servo parameter means the same content in the previous power shutoff.

※ The servo parameter sum check function can change the content by the parameter. (For details, refer to the explanation of parameters.)

1.2.2.
System information

The version of system program for the controller is displayed and the creation date of software is also displayed on its right side.

<div style="background-color:#c5f041; padding:20px;">

Ver 1.00I   2002-04

</div>

Version Display

1.2.3.
EDIT Information

The channel number of program selected in the screen start and the coordinate of machining zero position that the channel is common are displayed.

CH00 A   0. 000

<u>EDIT Information for 1 Axis</u>

CH00 A   0. 000
     B   0. 000

<u>EDIT Information for 2 Axis</u>

2   Key Switches & Display Part

Controller's switches and operation keys feature various operations.

During operation, each mode LED and the screen may indicate machine conditions.

.   Operation switches

    1.   Power switch

    2.   Emergency stop switch

    3.   ENABLE switch

.   Operation keys

    1.   Mode operation

    2.   Axis change operation

    3.   Manual operation

        JOG feed

        Zero position return

        Machining zero position return

    4.   Automatic operation

    5.   Program operation

    6.   Program communication

    7.   Parameter operation

    8.   Parameter communication

    9.   Self diagnosis operation

    10.   Operation in alarm

.   Lamp indication

    1.   MODE

    2.   STATUS

    3.   CPU status

.   Data display

2.1.   Operation switches

2.1.1.
Power switch

Turns ON the power of controller.

When pushing the locker switch to   side, the power is turned ON and to   side, the power is turned OFF.

2.1.2.
Emergency stop switch

This button is pushed when stopping the rotary table urgently.

When the emergency stop button is pushed, the power to the servo is turned OFF and the rotary table stops urgently.

When the emergency stop button is pushed, the table is self-held and it does not return automatically to the zero position. To release the emergency stop switch, manually turn the operation part to right.

To release the emergency stop state, push   RESET   button manually after releasing the above operation to recover the circuit.

2.1.3.
ENABLE switch

The pendant is equipped with enable switch for 3 positions. When the manual operation and automatic operation from the pendant are performed, place the enable switch to intermediate position.

When the signal of enable switch is not detected (switch release or more pushed) while the machine is running, the machine stops immediately.

Operation of 3-position enable switch
- Switch is not pushed.
          ······· Position 1: Switch OFF
- Pushed to intermediate position.
          ······· Position 2: Switch ON
- Pushed over intermediate position.
          ······· Position 3: Switch OFF

ENABLE switch

Position 1   OFF

Position 2   ON
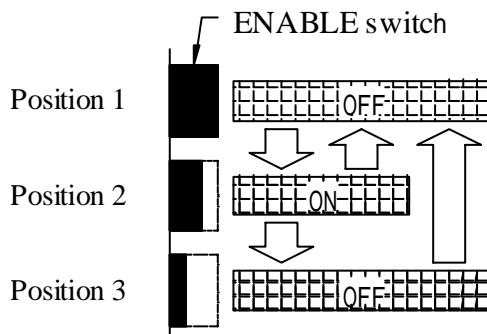
Position 3   OFF

- Even if the switch is returned to position 2 from position 3, the switch does not turn ON.

2.2. Key operation

2.2.1.
Mode operation key   To perform each operation, it is necessary to select each operation mode.

➤ **Mode change key**   [MODE]   Changes the mode in order.

2.2.2.
Axis change key   Since MAC mini iH2/iHT have two control axes, it is necessary to change the axis when each mode is set.

[A/B]   Changes the display of A-axis/B-axis as often as the switch is pushed.

2.2.3.
Manual operation keys   This key operates and sets the circular table connected to the controller under the manual operation mode.

➤ **JOG feed**   [INS]   Operates the table in CW (Clockwise direction). The table rotates continuously at speed set to PRM005 with the key still pushed.
   (low speed)
ENABLE switch

[DEL]   Operates the table in CCW (Counterclockwise direction). The table rotates continuously at speed set to PRM005 with the key still pushed.
ENABLE switch

➤ **Step feed**   [INS]   Pushing this key 1-shot feeds at a step in CW (Clockwise direction). The feedrate is the angle set to PRM006.
ENABLE switch
  1-shot pushed

[DEL]   Pushing this key 1-shot feeds at a step in CCW (Counterclockwise direction). The feedrate is the angle set to PRM006.
ENABLE switch
  1-shot pushed

➤ **JOG feed**   [H] [INS]   Operates the table at rapid traverse in CW (Clockwise direction)
   (high speed)
ENABLE switch   The table rotates at speed set to PRM004.

[H] [DEL]   Operates the table at rapid traverse in CCW (Counterclockwise direction)
ENABLE switch   The table rotates at speed set to PRM004.

> **M/C zero position return**

ENABLE switch

Returns the table to M/C zero position.

When the STATUS " READY A" or " READY B" lamp lights, the table rotates to the M/C zero position at high speed of PRM003.

When STATUS" READY A" or" READY B" lamp goes out (PRM123=0), the M/C zero position is set at value set to PRM122.

> **Machining zero return**

ENABLE switch

Returns the table to the machining zero position at the speed set to PRM003.

> **Machining zero position setting**

Sets the current position as the machining zero position.

However, since the priority for keys is established, it is necessary to push the ⬚ **INPUT** key with the ⬚ **ORG** key still pushed.

> **Override**

Displays the current override state.

> ## CH00 A ovr. 100
> ## N000

Increases the override value.

The increased value of override is set to PRM014.

Reduces the override value.

The reduced value of override is set to PRM014.

• **State display**

When the mode is set to "AUTO" or "MANUAL" with the override set to 100%, the mode LED lights and with the override set to the point except 100%, it flickers.

2.2.4.
Automatic operation keys

This key is for operating the program automatically.

> **Operation control key**

ENABLE switch

Executes the program operation.

Or, restarts the program while stopping once.

Stops the program once while executing.

Rewinds the program of selected channel to return it to a top block.

2.2.5.
Program operation keys

These keys are used for editing the program to operate the circular table automatically.

(For detailed program, see 4. Program.)

The following procedure is recommended for operating the program under the EDIT mode.

➢ **Address keys**

$\boxed{1_E}\boxed{2_L}\boxed{4_D}$
$\boxed{5_F}\boxed{6_P}\boxed{7_G}$
$\boxed{8_A}\boxed{9_J}$
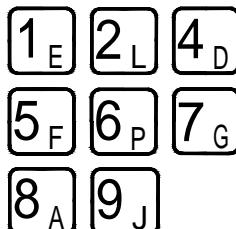
Pushed when various addresses are selected.

➢ **Numerical keyboard**

$\boxed{0_{CH}}\boxed{9_J}$
$\boxed{_{NH}}\boxed{-_N}$
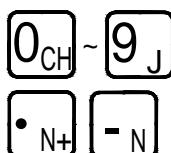
Pushed when numerical values are inputted.

➢ **Channel key**

$\boxed{0_{CH}}$

This key is for selecting the channel.

➢ **Rewind key**

$\boxed{RESET}$

Rewinds the program of selected channel to return it to the top block.

➢ **Program EDIT keys**

$\boxed{ENT}$

Establishes the selected address to be edited and determines the inputted value.

$\boxed{CAN}$

Cancels the established address and determined input value.

$\boxed{CL/DGN}$

Erases the set value of EDIT address.

$\boxed{INPUT}$ $\boxed{MODE}$ $\boxed{_{NH}}$
$\boxed{3_{NJ}}\boxed{0_{CH}}$
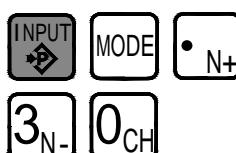
Stores the program after editing.

If the power is turned OFF without operating left keys, the program in the block finally edited is not stored, thus eliminating its edited program.

• **Status display**

When the selected address is established by $\boxed{\textbf{ENT}}$ key, the character of selected address flickers on the screen and the data is erased.

When editing the program by **ENT** key, " /A/" which displays the screen axis flickers.

When storing the edited program with "/A/" flickered, "/A/" lights.

➤ **Block key**

Used for specifying the block number. After inputting this key, the specified block number is continuously inputted.

Calls a next block for a current block.

Calls a former block for a current block.

➤ **Block EDIT keys**

Copies the selected block or the selected channel to another channel.

Deletes the selected block or the program of selected channel completely.

Determines block copy, block deletion, channel copy, etc.

Pushed for 2 seconds

Shifts a channel copy screen.

Copies all program of selected channel to another channel.

```
Copy    00--00
```

Pushed for 2 seconds

Deletes the program of selected channel.

The following message is displayed while all programs are being executed.

```
CH03 PRG DEL
```

Cancels variously established modes.

• **State display**

When block copy or block DELETE is established by **INS** and **DEL** keys, the block number flickers on the screen.

2.2.6.
Program communication keys

These keys are used for communicating the program data to external equipment.

The following procedure is recommended for operating the program under the EDIT mode.

> **Channel key**

This key is used for selecting the channel.

> **Communication key**

This key is used for inputting the program to the selected channel from the external equipment.

CH00 IN END

This key is used for outputting the program of selected channel to the external equipment.

CH00 OUT END

• **State display**

When the external INPUT or OUTPUT of program is selected, the external communication is started and the message showing I/O and the block No. while communicating are displayed on the screen. When the communication is finished, the message of "END" is displayed.

> **Communication EDIT key**

Cancels variously established modes and interrupts data communication.

2.2.7.
Parameter operation keys

These keys are used for operating various parameters to control the circular table.

(For detailed parameters, see Clause 15 Parameters.)

The following procedure is recommended to operate the table under the PARAM mode.

> **Numerical keyboard**
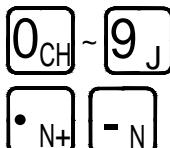
The numerical keyboard has ten-key and mark keys to input the number and set value of each parameter with these keys.

➢ **Block keys**	$\boxed{-\text{N}}$	Used when the parameter No. is specified. The specified parameter No. is continuously inputted after inputting this key.
	$\boxed{\text{N}\uparrow}$	Calls a parameter of next number.
	$\boxed{3_{\text{N}\downarrow}}$	Calls one former parameter No.
➢ **Parameter EDIT keys**	$\boxed{\text{ENT}}$	Establishes the parameter No. to be changed and determines an inputted value.
	$\boxed{\text{CAN}}$	Cancels the established parameter No. to be changed and also, cancels the determined input value.
	$\boxed{\text{CL/DGN}}$	Clears the set value of parameter and sets value "0".
	$\boxed{\text{INPUT}}$	Stores the parameter after changing it.

2.2.8. Parameter communication keys

These keys are used for communicating the parameter data to external equipment.

The following procedure is recommended for operating the program under the PARAM mode.

➢ **Communication keys**

$\boxed{\text{INS}}$ Inputs parameters from external equipment.

When this key is pushed, the following external parameter INPUT screen is displayed.

> **PARAMETER IN**

$\boxed{\text{DEL}}$ Outputs the parameters to external equipment.

When this key is pushed, the following external parameter OUTPUT screen is displayed.

> **PARAMETER OUT**

• **State display**   When the external INPUT or OUTPUT of parameter is selected, the external communication screen appears. During data communication, the message and the parameter No., are displayed. When the communication is finished, the message of "END" is displayed.

➢ **Communication**   Cancels variously established data and interrupts the
  EDIT keys   data communication.

2.2.9.
Self-diagnosis   Operated for checking various conditions of circular table.
operation keys   (For details, see Clause 7. Self-diagnosis.)

                            The self-diagnosis screen becomes effective under   AUTO   MANUAL
                            and   SINGLE   modes.

➢ **Self-diagnosis**   Various self-diagnosis screens are changed and
  display key   displayed in order.

➢ **Operation key**   This is the positive direction change key that the
                            signal displayed in the I/O self-diagnosis means what
                            to be displayed.

                            This is the opposite direction change key that the
                            signal displayed in the I/O self-diagnosis means what
                            to be displayed.

                            Selects the top of signal displayed in I/O diagnosis.

2.2.10.
Operation keys in   When some alarms occur, ALARM LED of STATUS flickers.
alarm   At this time, the alarm contents except display can be checked with the
                            following keys.
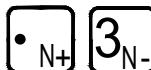
➢ **Change keys**   When some alarms occur, the operation can be
                            changed with the left keys in order.

2.3.   Lamp indication

2.3.1.
MODE   Displays that the mode selected for each operation is which mode.

```
MODE
  ● ⬜ AUTO
  ● ✋ MANUAL
  ● ✎ EDIT
  ● ✑ PARAM
  ● ⬚ SINGLE
```
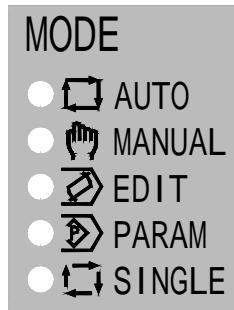
When the LED of selected mode becomes red, the lamp lights.

AUTO   Auto operation mode
            When override is other than 100%, the lamp flashes.

MANUAL   Manual operation mode
            When override is other than 100%, the lamp flashes.

EDIT   Edits, inputs and output the programs.

PARAM   Sets, inputs and output the parameters.

SINGLE   Makes single operation with the controller.

* When all LEDs of MODE light with power ON, since CPU error occurs, turn OFF power once and turn ON the power after elapsing 5 seconds.

2.3.2.
STATUS   Displays the conditions of controller.

STATUS
● RUN
● STOP
● RESET
● ALARM
● READY A
● READY B

When the LED of STATUS becomes red, each lamp lights.

RUN	Lamp lights during auto operation.
STOP	Lamp lights during operation stop. When machine is held during auto operation, the lamp lights simultaneously with RUN.
RESET	Lamp lights just after power ON and after resetting.
ALARM	Lamp lights when alarm occurs. The lamp flashes while alarms occur redundantly.
READY A	MZRN position of A-axis is established.
READY B	MZRN position of B-axis is established.

*   When all LEDs of STATUS light with power ON, because CPU error occurs, turn OFF power once and turn ON the power again after elapsing for 5 seconds.

2.3.3.
CPU status   It is displayed that CPU is correctly started.

STATUS
● CPU NORMALCY
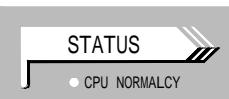
When "CPU NORMALCY" does not light with power ON, CPU error occurs. Turn OFF power once and turn ON the power again after elapsing for 5 seconds.

2.4.   Data display

2.4.1.
Data display part   Displays LCD (Liquid Crystal Display) to display various data.

The following shows the basic display screen of each mode.

➢ **AUTO**

➢ **MANUAL**

➢ **SINGLE**

Axis name — Channel — Angle

```
CH05 A    0.000
N000         VP-R
```

Block — Displayed content

➢ **EDIT**

Axis name — Channel — G-address — A-address

```
CH05 /A/G90A90.000
N000 F0    D   J
```

Block — F-address — J-address — D-address

EDIT Screen for 1 axis

Axis name — Channel — G-address — A-address

```
CH05 /A/G90A90.000
N000 F0    D   J   <
```
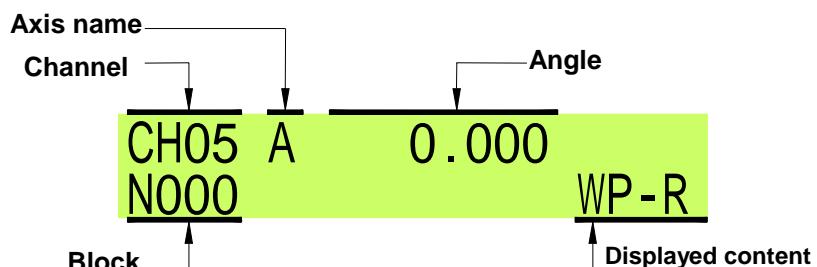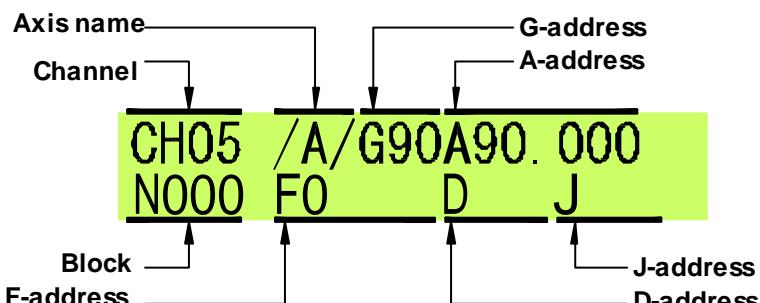
Block — F-address — Other axis mark — J-address — D-address
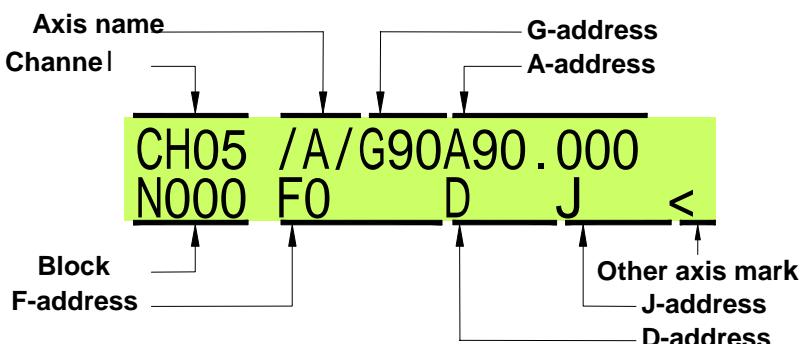
EDIT Screen for 2 axis(A-axis)

➢ **PARAM**   Parameter No. — Parameter set value

```
A:110        0
PRM INPUT PERMISSION
```

Parameter Message
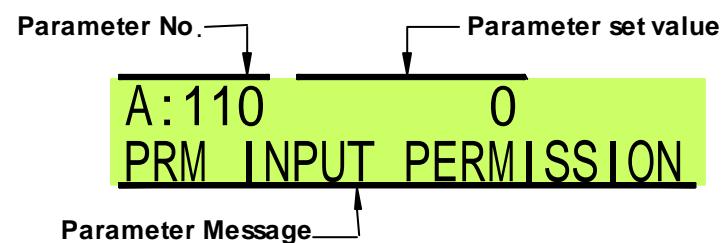
3   Mode

3.1.   Mode selection

3.1.1.
Mode selection

To perform each operation, it is necessary to select each mode.

The mode is changed in order as often as **MODE** key is pushed.

However, the selected mode differs by the UNESTABLISH/ESTABLISH modes for setting the MZRN position.

In MZRN position setting UNESTABLISH mode

[MANUAL]   [EDIT]   [PARAM]   [MANUAL]

As shown the above, spaces between **[MANUAL]   [EDIT] [PARAM]** are looped.

In MZRN position setting ESTABLISH mode

[MANUAL]   [EDIT]   [PARAM]   [SINGLE]
[AUTO]   [MANUAL]

As shown the above, spaces between**[AUTO]   [MANUAL]   [EDIT] [PARAM]   [SINGLE]** and all modes are looped.

※   When power is turned ON, the system is started at   MANUAL   mode.

3.1.2.
External mode selection

After setting the machine zero position,   AUTO   and   MANUAL   modes can be selected with the external input signals.

External mode selection spec.

The external mode can be selected when the controller is ready. When the controller is not ready, the external mode cannot be selected even if AUTOSET or MANUALSET is inputted.

READY status means that the machine zero position is set.

External modes can be changed even from any modes.

However, when the following status, the mode cannot be changed.

● While the program is editing under EDIT mode.

● While the parameter is setting under PARAM mode.

Only either mode is to be inputted. When both modes are inputted, an alarm occurs.

● Err219   EXT MODE SEL ERROR (External mode selection error)

The mode after external mode input OFF returns to the mode just before input ON.

With external mode input ON, the panel mode is not selected.

3.2. Outline of mode

3.2.1.
Outline of mode

Mode	Description
AUTO Auto Run	➢ Operates the program edited by EDIT mode automatically. ➢ Executes the program block by block as often as a start signal is inputted. ➢ Interlocks M-signal from an external start signal.
MANUAL Manual Run	➢ Rotates the circular table manually. ➢ Performs a manual MZRN, manual WZRN and WZRN position setting. ➢ Operates a manual pulse generator too.
EDIT (Program EDIT)	➢ Edits the program for automatic operation. ➢ Inputs and outputs the program from/to the external equipment. ➢ Communicates the programs to some personal computers with the data management software. (It is necessary to use the exclusive data management software.)
PARAM (Parameter)	➢ Edits the parameters for operational conditions and data setting required for controlling by the controller. ➢ Inputs and outputs the parameters from/to external equipment. ➢ Communicates the parameters to some personal computers with the data management software. (It is necessary to use the exclusive data management software.)
SINGLE (Single Run)	➢ Does not output a BLKFIN and a G99FIN in case of SINGLE mode though an operation content is the same as an AUTO mode.

4   Programs

4.1.   Program structure

The program consists of   Channel   ,   Block   ,   Address   and   Data   .
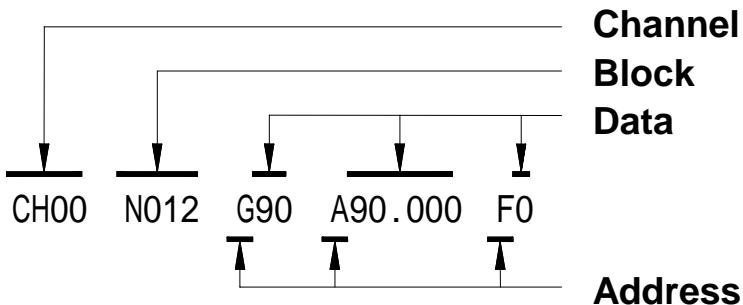
Channel   To classify the multiple programs stored into memory, each block is called the channel.

Though 16 channels are prepared usually, maximum 90 channels can be increased optionally by parameter change.

Block   The programs in the channel are numbered with block No., in order from the program top.

Address   Address shows factors required for the programs such as angle, speed, etc., with alphabetic characters.

Data   Data means the value set to each address.

4.2.   Program area structure

The program in the controller manages the information of channels and blocks into the memory (EEPROM).

Area structure

The operation program is stored in the area called the program area.

The size of this storage area (program area) is fixed and the area has the capacity of 2000-block.

For this reason, the program can be created into the max. total capacity of 2000-block.

However, one channel (program block) cannot occupy all blocks. This program area is divided into min. 2 channels ~ max. 90 channels.

In the standard, this program area is divided into 16 channels.

Dividing of program area

Standard Volume   50 blocks are summed up to one lot.

CH00			CH02	CH04	CH06	CH08	CH10	CH12	Ch14
		CH01	CH03	CH05	CH07	CH09	CH11	CH13	CH15

In case of standard, the number of channels and the number of blocks are determined.

     CH00   500-block   Block Nos. N000   N499

     CH01   CH15   100-block   Block Nos. N000   N099

In case of extension, the number of channels and the number of blocks can be changed optionally.

However, maximum set values are as follows:

Number of channels: 90   Number of blocks: 1000

Extension Volume   50 blocks are summed up to one lot.   Example

CH00				CH01				

CH00	CH04	CH08	CH12	CH16	CH20	CH24	CH26	CH28	CH30
CH01	CH05	CH09	CH13	CH17	CH21		CH27		
CH02	CH06	CH10	CH14	CH18	CH22			CH29	
CH03	CH07	CH11	CH15	CH19	CH23	CH25			

To simplify the above, though 50 blocks are summed up to one lot, the number of channels can be set at 1 block unit.

4.3.   Program display method

The program is displayed on the LCD by editing the mode.

Though Channel and Block are usually displayed, the display contents of Address and Data are changed by the program contents.

Since this is divided into two addresses (NEEDED/UNNEEDED) by G-code inside of program, unneeded address is not displayed.

EDIT Screen Display on 2nd Axis
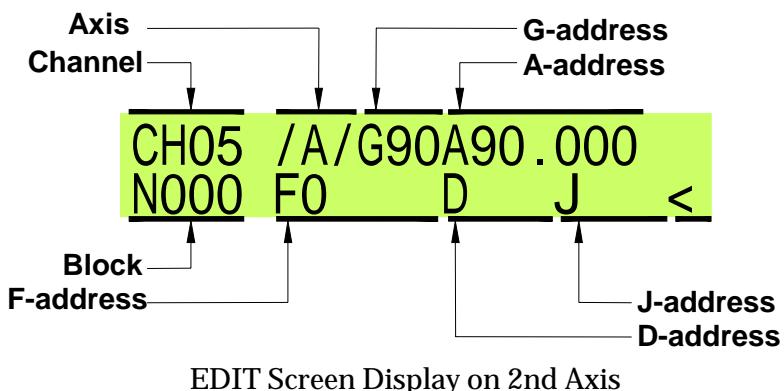
①	Channel	Displays the number of program channel currently selected.
②	Block	Displays the number of program block currently selected.
③	Axis name	Displays the axis No. currently selected.

In case of exclusive control for 1-axis, /A/ is displayed usually.

In case of the exclusive controller for 1-axis, the change key A/B can change the key to /A/ or /B/ .

④ **G-address**   For address G, prepared G-code command is displayed.

When only address G is displayed, the data shows nil.

⑤ **A-address**   Address A that shows the angle and time is displayed on the upper right stage.

When only address A is displayed, the data shows nil.

⑥ **F-address**   Address F that shows rotation speed is displayed on the right side of lower stage block No.

When only address F is displayed, the data shows nil.

⑦ **D-address**   Address D that shows the dividing is displayed on the right side of lower stage address F.

When only address D is displayed, the data shows nil.

⑧ **J-address**

Address J that shows jump is displayed on the lower right stage.

When only address J is displayed, the data shows nil.

⑨ **Other axis mark**

In 2-axis spec., when the program exists to the axis that is different as the screen display axis, this mark is displayed.

In 1-axis spec., this mark is not displayed.

```
CH05 /A/G27P50 E70
N000         L5  J99
```

G27 Screen Display
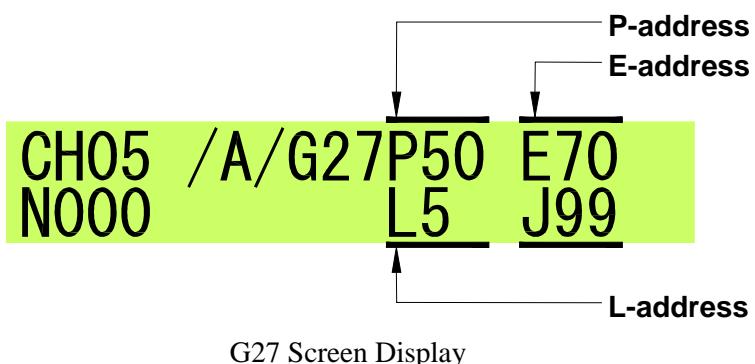
⑩ **P-address**

Address P that shows the start block No., of repeating function is displayed to the right side of G27 on the right stage only when G27 is commanded.

When only address P is displayed, the data shows nil. At this time, when the program is stored, the alarm of   Err962 EDIT ILLEGAL G   occurs.

⑪ **E-address**

Address E that shows the end block No., of repeating function is displayed to the upper right side only when G27 is commanded.

When only address E is displayed, the data shows nil. At this time, when the program is stored, the alarm of   Err962 EDIT ILLEGAL G   occurs.

⑫ **L-address**

Address L that is optionally outputted in the repeating frequency of its function or interlocking function (G21) is displayed on the center of lower stage.

The address L is displayed only when G21 and G27 are commanded.

When only address L is displayed, the data shows nil. When the program is stored with G27 commanded, the alarm of   Err962 EDIT ILLEGAL G   occurs.

4.4. Address functions

The detailed explanation of addresses for program structure is as follows:

Address	Content	Set unit	Set range	Remarks
	See the Clause of G-code function.			
	Rotation angle command	degree	± 999.999	
	Dwell time command	sec	0.01 999.99	
	Rotation speed command	$0.01min^{-1}$	0 3 9999	It becomes the setup of $0.025min^{-1}$ when the setup of 1 or 2 is done.
	Jump command	Block No.	0 998	When jumped to block before command block.
	Subroutine command	Block No.	1 999	When jumped to block after command block
	Return command	Return No.	-1	Single subroutine end
	Dividing command	Dividing number	0 999	
	Start block command of repeating function (G27)	Block No.	1 999	
	End block command of repeating function (G27)	Block No.	1 999	
	Repeating frequency command of repeating function (G27)	Repeating number	1 999	
	G99 command of interlock start function (G21)	G99 command number	99	G99 can be commanded in the same block as G21.

4.5. G-code functions

The controller provides the preparatory function (G-code) to allow the machine to make the determined operation. The preparatory function command is indicated with the value continued to the address G.

The G-code is divided into two types.

Type	Contents
One shot G-code	G-code effective only block specified
Modal G-code	G-code effective continuously until a reciprocity G-code is commanded.

> ➤ Any G codes marked with   are in the modal information column of G-code list are modal type. The G code marked with   becomes effective continuously until the G-code marked with   is commanded. Similarly, the G code marked with   becomes effective continuously until the G-code marked with   is commanded.
> ➤ G codes except marks   are one shot type.
> ➤ Model information is returned to the initial setting mode which becomes the state marked with   of the modal information list, when MAC-controller is operated by turning the power off, reset, mode change, channel change by the panel, and external channel change(PRM112=1).
> ➤ When any G-code except the G-code in the list is commanded, the alarm of Err940 PROG G ERROR (Program G-code error) occurs.

Precautions)

● Even if the program is executed at 2-axis spec., modes do not synchronize. The program is executed the program content set every axis.

● When the block having programs for two axes is executed, BLKFIN is outputted after programs of both axes are completed.

G-code	Function Name	Description	Modal inf.
None	ROTATION SPEED COMMAND	Only index command is possible.	
G04	DWELL	Waits for some times without shifting.	
G07	LEAD CUT	Rotates the table repeatedly.	
G08	CONT. BUFFER	Executes the program block continuously. CONT. EXECUTE becomes effective until next G09 is commanded.	
G09	CONT. BUFFER CAN.	Cancels the continuous buffer of G08 to return it to usual SINGLE BLOCK EXECUT.	
G10	CLAMP UNUSED	Makes CLAMP MEC in table stop in an unused state. CLAMP MEC UNUSED becomes effective until next G11 is commanded.	
G11	CLAMP USED	Cancels CLAMP MEC UNUSED state of G10 and clamps the table in table stop.	
G15	POS-DEV CHECK VALID	Emphasizes joint by checking POS-DEV Between program blocks when CONT. BUFFER becomes effective (G08). POS-DEV CHECK becomes valid until next G16 is commanded.	
G16	POS-DEV CHECK INVALID	Cancels POS-DEV CHECK MEC. VALID state of G15 and POS-DEV is not checked between program blocks.	
G21	INTERLOCK START	Outputs BLKFIN SIGNAL in program execution before operation and it is used for interlocking operation with the machine.	
G22	CONT. START	When G22 is commanded, the table rotates continuously until next START is inputted.	
G23	MZRN	Positions the table in MZRN position.	
G24	WZRN	Positions the table in zero position of work coordinate system.	
G25	LOOP JUMP	Loops the program until reaching WZRN. When reaching WZRN, the program jumps out of the loop and it executes next block.	
G27	REPEATING	Repeats the program from specified block to block to specified number of times.	
G90	ABSOLUTE	Positions the table at the absolute coordinate of work coordinate system.	
G91	INCREMENTAL	Positions the table at the relative coordinate.	
G92	WCRD SYS SET	Sets WZRN position optionally with the program.	
G97	BLKFIN NON-OUTPUT	Not output BLKFIN.	
G98	BLKFIN/G99FIN OUTPUT	Outputs both BLKFIN and G99FIN.	
G99	G99FIN OUTPUT	Outputs only G99FIN without outputting BLKFIN.	

4.5.1.　Non-G-code

When G-code is unnecessary on positioning, dividing motion, subprogram, etc., this code is set.

In case of non G-code block, the program is operated at the modal state before executing block. The address of this non-G-code type is used normally.

Program　Format

A　　*F*　　*D*　　*J*

Boldface and italic type characters can be abbreviated.

A	Rotation angle	Setting unit	deg	
		Setting range	± 999.999	
			In incremental	
			0　　359.999	
			In absolute	
F	Rotation speed	Setting unit	0.01min^{-1}	
		Setting range	0　3　　9999	
D	Equal dividing number	Setting range	0　　999	
J	PRM jump destination	Setting range	-1　　999	
		J-1　　Subprogram return command		

Description

Modal information absolute – Address A (Rotation angle)

- The address A is set at 0　359.999 within one rotation by regarding WZRN position as "0".
- When the value of 360 or more is set to the Address A by program communication, the alarm of　Err216　ANGLE ERROR IN ABS　Angle error in absolute command　　occurs.
- When set over set range, the alarm of　Err944　PROG A ERROR　Program A-address INPUT error　　occurs.

Modal information incremental – Address A (Rotation angle)

- The relative rotation angle from current position is set at value of ± 999.999.
- Unless otherwise Address J is commanded independently, the Address A becomes the essential setting address.
- When set over set range, the alarm of　Err944　PROG A ERROR　Program A-address INPUT error　in continuous buffer VALID occurs.

Address F (Rotation speed)

- When F is not set, the feedrate set at a former block is used continuously as the modal information.

  However, the program setting the feedrate is not executed once before executing block, the alarm of   Err210   F DATA ERROR   Feedrate data error   occurs.

- When set to "F0", the table rotates at set speed of PRM003 (Rapid traverse).

  However, override becomes effective during automatic operation. When the override is set other than 100%, the LED of AUTO mode flickers.

  When the override more than the set speed of MAX. or PRM003 is set, speed is clamped at the upper limit of PRM003 speed.

Address D   Equal dividing number

- If there is no D-setting or "0" or "1" is set, an usual positioning is performed as non-divide.

- When the relationship between A-command and D-command is A/D<Min., shift unit (0.001 deg), the alarm of   Err207   DIVIDE CMD ERROR   Divide command error   occurs.

- When the modal information is absolute and Address D is set at the same position as the current position, the alarm of   Err207   DIVIDE CMD ERROR   occurs when the program is executed.

Address J (Jump)

- When J is not set, the program advances to next block after finishing the block.

- When the block No. is set to J, the program jumps to the specified block No., after finishing the block.

- When "J-1" is set inside of program at the subprogram, the program returns to the main program.

Input regulation of 2-axis spec.

➢ When address J is commanded to each axis, the same address J is automatically set to another axis.

4.5.2.   DWELL

The program waits by the specified time to delay the movement to next block operation.

Program Format

G04   *A*   **J**   Boldface and italic type characters can be abbreviated.

G04	Dwell time		
A	Waiting time	Setting unit	second
		Setting range	± 999.999
J	PRM jump destination	Setting range	-1 999
		J-1	Subprogram return command

Description   Address A (Waiting time)

- When Address A is not set, an internal processing is performed without waiting time, BLKFIN is outputted simultaneously with START.

Address J is the same as "Non-G code Type (Standard)".

Precautions on 2-axis spec.   When commanding G04, 2-axis specifications are limited to the following items.

➢ When commanding G04 on both axes, "Err962 EDIT ILLEGAL G" occurs.

➢ The output timing of BLKFIN is as follows:

1. When a dwell time is longer than the time of axis that the operation command is completed, BLKFIN is outputted after the dwell is completed.

2. When a dwell time is shorter than the time of axis that the operation command is completed, BLKFIN is outputted after the dwell is completed.

3. When any data is not set to either axis, the BLKFIN is outputted after the dwell is completed. However, since non-command axis is also unclamped and clamped, when the dwell time shorter than its time is set, the BLKFIN is outputted after the axis is unclamped and clamped.

Timing chart

In case of 1 axis spec.

Start

BLKFIN

Dwell time
Address A set value

PRM035

In case of PRM035=0,
BLKFIN is turned OFF at
start OFF.
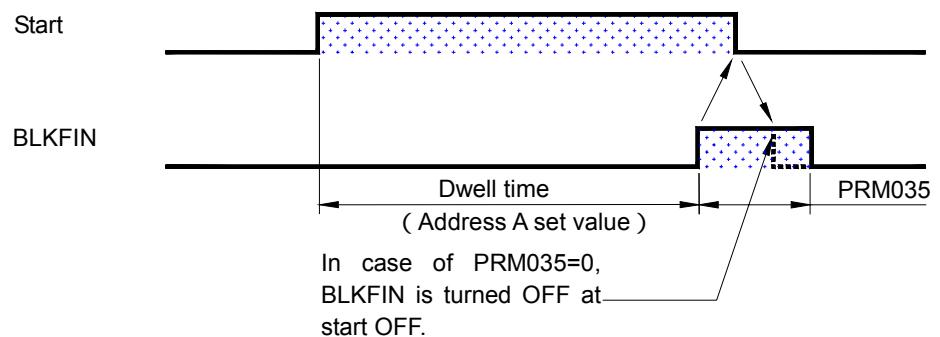
In case of 2 axis   Precautions 1   (Example   /A/A360F500/B/G04A10)

Start

A-axis rotation

B-axis

Dwell time
Address A set value

BLKFIN

In case of PRM035=0,
BLKFIN is turned OFF at
start OFF.

PRM035
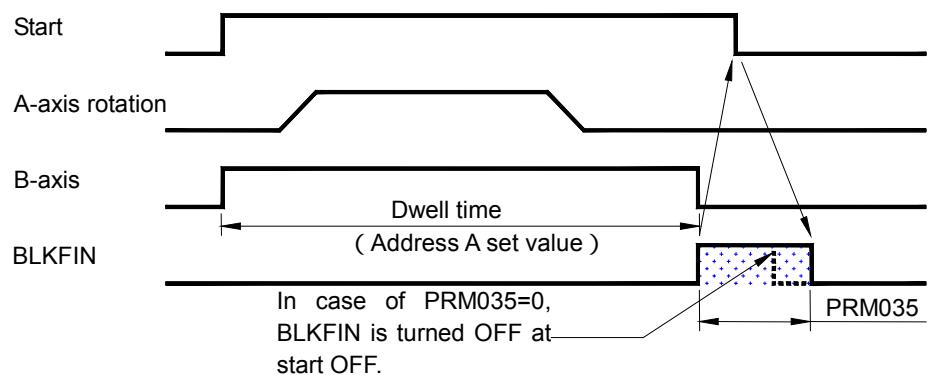
In case of 2 axis   Precautions 2   (Example   /A/G04A1/B/A360F500)

Start

A-axis

Dwell time (Address A)

B-axis rotation

B-axis
CLAMP

UNCLAMP

CLAM

BLKFIN

In case of PRM035=0, BLKFIN is
turned OFF at start OFF.

Blk COMPLETED TIMER
PRM035(STD set value:500msec)
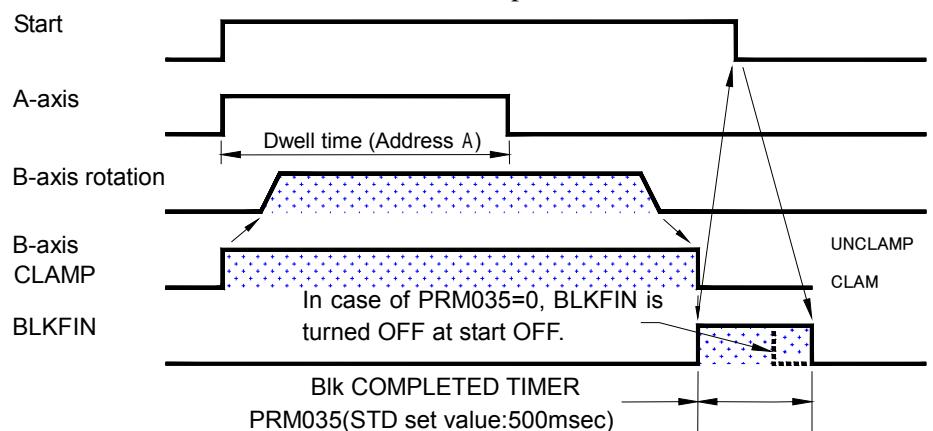
4.5.3.   LEAD CUT

When performing the multiple rotating index at ± 999.999deg or more that cannot be indexed on usual index, max. 1000-rotation (999-rotation +360deg) can be indexed by commanding G07.

Program Format

| **G07** | **A** | *D* | *F* | *J* | Boldface and italic type characters can be abbreviated. |

G07	Lead cutting command		
A	Rotary direction & rotary angle	Setting mark : Rotary direction deg deg Setting range ± 360.000	
D	RPM	deg Setting range 0 999	1 rotation (360.000deg)
F	Rotation speed	deg Setting range 0 3 9999	$0.01min^{-1}$
J	Program jump destination	Setting range -1 999 J-1 Subprogram return command	

Description

Address A (Rotary direction + Angle)

●   Marks "   ","   " of Address A show the rotary directions.

●   When the modal information is an absolute command, after rotating by rpm of Address D in the specified rotary direction of Address A, the table rotates for the absolute positioning in the same direction above. (See Fig. 4.5.3-1.)

Address D (Rotation speed)

●   When D is not set, the rotation speed is 0 and the same positioning as usual index is performed.

Address F and J are the same as "Non-G code Type (Standard)".

Concerned parameters | PRM021 | The timing of BLKFIN OUTPUT in G07 command is changed to START or FINISH.

0   Outputs BLKFIN when G07 block execution is finished.

1   Outputs BLKFIN when G07 block execution is started.

(OUTPUT starts after about 10msec from ST INPUT.)

Timing chart

PRM021=0 , PRM032=0

Start

Rotation

Clamped   Unclamp

                                                           Clamp

BLKFIN   In case of PRM035=0, BLKFIN is turned
              OFF at START OFF.

BLKFIN Timer
PRM035 (STD Set value: 500msec)

PRM021=0 , PRM032=1

Start

Rotation

Clamped   Unclamp

                                                           Clamp

BLKFIN   In case of PRM035=0, BLKFIN is
              turned OFF at START OFF.

BLKFIN Timer
PRM035 (STD Set value: 500msec)

PRM021=1 , PRM032=0

Start

Rotation

Clamped   Unclamp

                                                           Clamp

              In case of PRM035=0,
BLKFIN   BLKFIN is turned OFF at START OFF.

BLKFIN Timer
PRM035 (STD Set value: 500msec)

PRM021=1 , PRM032=1

Start

Rotation

Clamped   Unclamp

                                                           Clamp

              In case of PRM035=0,
BLKFIN   BLKFIN is turned OFF at START OFF.

BLKFIN Timer
PRM035 (STD Set value: 500msec)

Precautions
1. The OUTPUT time of BLKFIN is the set time of PRM035 in PRM035   0. In case of PRM035=0, BLKFIN OUTPUT is turned OFF at the timing of START OFF.
2. Since CLAMP/UNCLAMP times are added by changing PRM032, the OUTPUT timing varies.

Operation examples   Different operation contents by command modal information

Execution program	G07 A30 D2 F0	
Modal information : Incremental	Modal information : Absolute	
The table rotates twice in + direction from the current position (Start point) and it advances at 30deg.	The table rotates twice in + direction from the current position and it advances at 30deg of work coordinate system.	
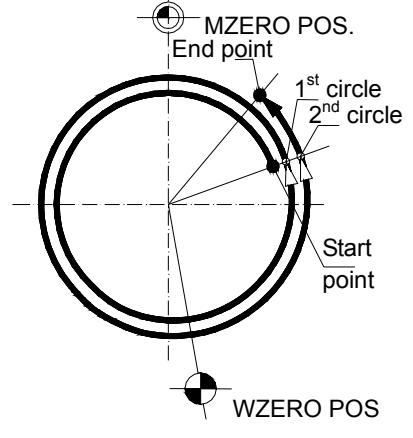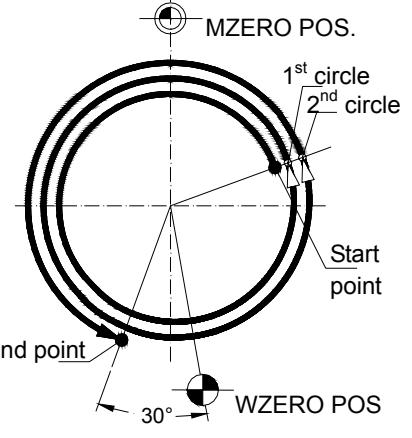
Execution program	G07 A−30 D2 F0	
Modal information : Incremental	Modal information : Absolute	
The table rotates twice in − direction from the current position and it advances at 30deg.	The table rotates twice in − direction from the current position and it advances at 30deg of work coordinate system.	

Fig. 4. 5. 3-1

4.5.4.   CONT. BUFFER

The blocks from a continuous buffer START COMMAND (G08) to END COMMAND (G09) are operated continuously.

In the block during continuous buffer execution, BLKFIN/G99FIN are not outputted.

Since G08 and G09 are modal commands, unless opposite command G08⇔G09 is commanded, they are continued continuously.

Program Format

G08
G09   *A   D   F   J*

Boldface and italic type characters can be abbreviated.

G08	Continuous buffer start command		
G09	Continuous buffer end command		
A	Rotation angle	Setting unit	deg
		Setting range	± 999.999
			In incremental
			0 359.999
			In absolute
F	Rotation speed	Setting unit	0.01min^{-1}
		Setting range	0 3 9999
D	Equal dividing number	Setting range	0 999
J	Program jump destination	Setting range	-1 999
		J-1 Subprogram return command	

Description   Addresses A, F, D and J are the same as "Non-G code Type (Standard)".

Precautions on 2-axis spec.   When commanding G08 and G09, 2-axis specifications are limited to the following items.

➢   When commanding G08, both axes execute buffer continuously.

➢   Since the program in command into the buffer mode are moved in next block after both 2 axes are operated, the axis that operation time is short stops and waits until other axis operation finishes.

➢   Though G8 may command either A-axis or B-axis, G09 is commanded to the axis that G08 is commanded.

When G09 is commanded to another axis, "Err230 ILLEGAL G09" occurs.

➢   For the block that G8 or G9 exists in each axis, G code cannot be programmed to another axis.

When G code is commanded, "Err962 EDIT ELLIAGAL G" occurs.

Inadequate program examples

Prg.G08 09-1   When G09 is commanded, command it to the axis that
                 G08 has already been commanded.

N000 **/A/G08**
N001 /A/G24/B/G24
N002 /A/A10.000F0/B/A45.000F0

N003 /A/A5.000**/B/G09**   <u>Because command axis is</u>
                                   <u>different, Err occurs.</u>

Prg.G08 09-2   Other G codes cannot be commanded into block of
                 G08 command.

N000 /A/**G08**/<u>B</u>/**G24**

Concerned parameters | PRM020 | The timing of FIN SIGNAL OUTPUT is changed to G08
                            START or G09 FINISH.

0   When G08 BLK operation is started, BLKFIN is
         outputted.

1   When G09 BLK operation is finished, BLKFIN is
         outputted.

Timing chart   <u>PRM020=0   ,   PRM032=0</u>
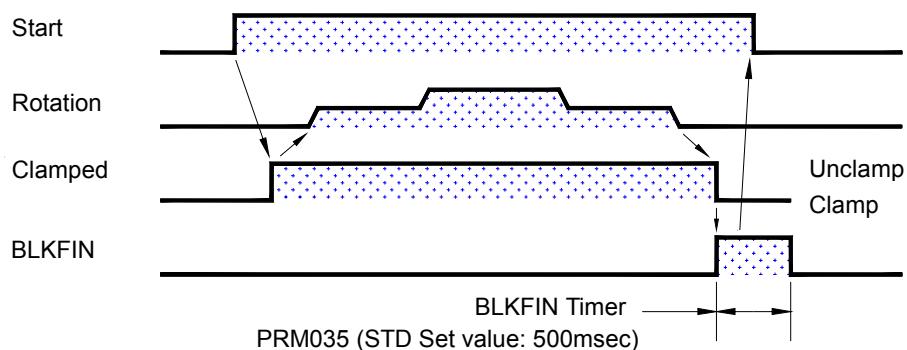
<u>PRM020=0   ,   PRM032=1</u>

<u>PRM020=1　,　PRM032=0</u>

Start

Rotation

Clamped　　　　　　　　　　　　　　　　　　　Unclamp
　　　　　　　　　　　　　　　　　　　　　　　Clamp

BLKFIN　　　　　　　　　In case of PRM035=0

　　　　　　　　　　　　　　　BLKFIN Timer
　　　　　　　　　　　　　　　PRM035 (STD Set value: 500msec)

<u>PRM020=1　,　PRM032=1</u>

Start

Rotation

Clamped　　　　　　　　　　　　　　　　　　　Unclamp
　　　　　　　　　　　　　　　　　　　　　　　Clamp

BLKFIN　　　　　　　　　In case of PRM035=0

　　　　　　　　　　　　　　　BLKFIN Timer
　　　　　　　　　　　　　　　PRM035 (STD Set value: 500msec)
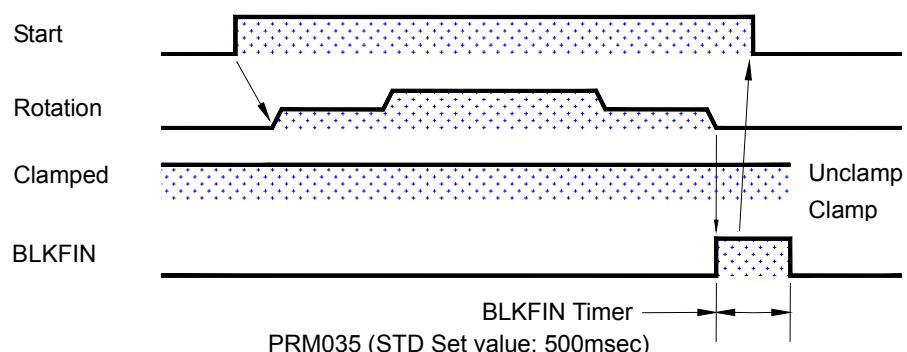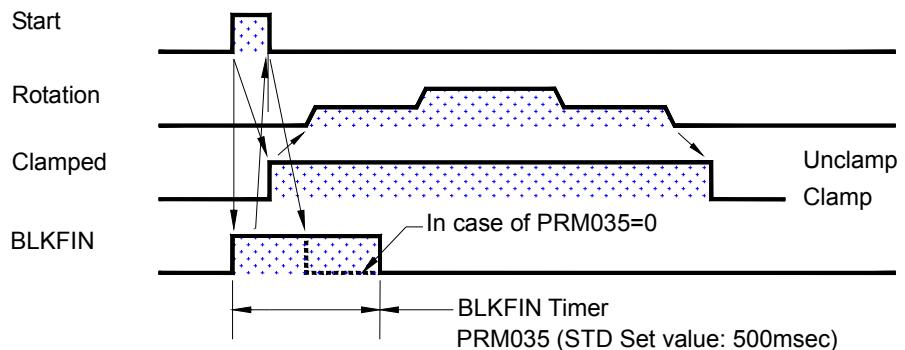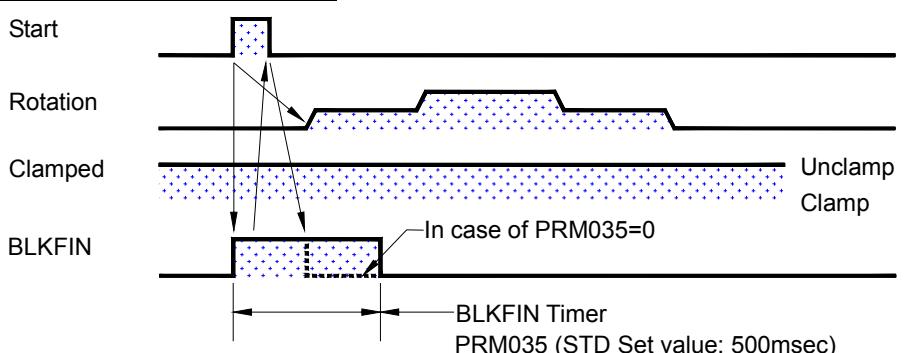
Precautions

1. Since CLAMP/UNCLAMP times are added by changing PRM032, the OUTPUT timing varies.

4.5.5.   CLAMP UNUSED/USED

When the clamp mechanism of the table is unused (usually unclamped state) by commanding a CLAMP UNUSED (G10), the clamp release time every block is eliminated and the system can be smoothly interlocked to the machine from the next block.

When PRM032=1, G10 becomes INVALID.

Since G10 and G11 are modal commands, unless opposite command G10⇔G11 is commanded, they are continued continuously.

When G10 is executed under the SINGLE mode, the table is clamped after G10 block is executed. (In the SINGLE mode, the table is clamped per block.)

Since G08 command unclamps the table at the space to G09, G11 command becomes invalid.

Program Format

G10

G11 *A*   *D*   *F*   *J*

Boldface and italic type characters can be abbreviated.

G10	Clamp unused	G10 is commanded independently.
G11	Clamp used	

A	Rotation angle	Setting unit	deg
		Setting range	± 999.999
			In incremental
			0 359.999
			In absolute
F	Rotation speed	Setting unit	0.01min^{-1}
		Setting range	0 3 9999
D	Equal dividing number	Setting range	0 999
J	Program jump destination	Setting range	-1 999
		J-1 Subprogram return command	

Description   Addresses A, F, D and J are the same as "Non-G code Type (Standard)".

Timing chart   Usual operation

Program examples
N000   G21 A90 F0
N001   G21 A90 F0

Start

Rotation

Clamped   Unclamp

                                                                 Clamp

BLKFIN

                                                   In case of PRM035=0,
                                                   BLKFIN is turned OFF
              About 200msec   at START OFF.
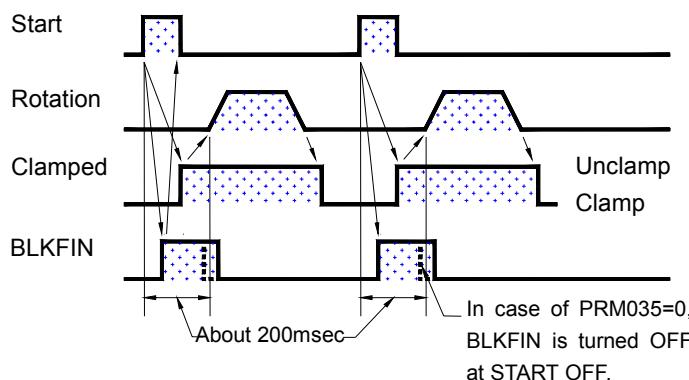
G10 Command operation

Program examples
N000   G10
N001   G21 A90 F0
N002   G21 A90 F0
N003   G11

              N000 N001   N002   N003
Start

Rotation

Clamped   Unclamp

                                                                 Clamp

BLKFIN

                                                   In case of PRM035=0,
  About 50msec   About 50msec   BLKFIN is turned OFF
                                                   at START OFF.
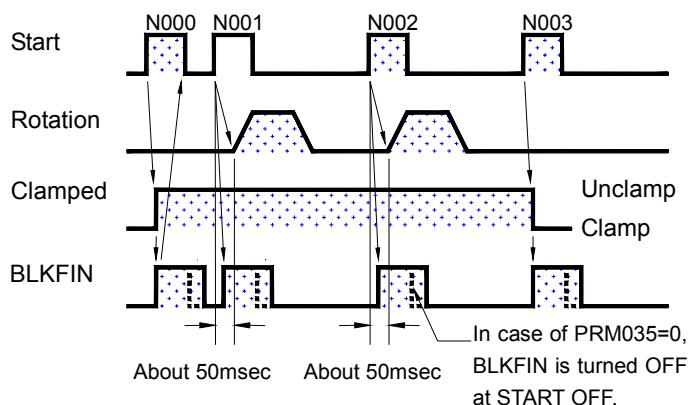
As shown in the above timing chart, though time of about 200msec is required usually from START INPUT to operation START, the clamped state becomes unclamped state by commanding G10. The time required for clamp release motion (clamp release/signal check) can be reduced from the next block and the motion can be started at about 50msec.

This mode is used when desiring to reduce a time difference as much as possible in interlocking motion with the machine.

However, the above time differs by the circular table type.

4.5.6.	POS-DEV CHECK VALID/INVALID

G15 command can emphasize the pastern between blocks by checking the position deviation every block during continuous execution of continuous buffer.

When POS-DEV CHECK INVALID, the table operates under non-deceleration fairly because of continuous operation between blocks through the look-ahead function of program.

Since G15 and G16 are modal commands, unless opposite command   G15⇔G16   is commanded, they are continued continuously.

G15 command becomes valid only inside of continuous buffer of G08.

Program Format

G15
G16   *A*   *D*   *F*   *J*   Boldface and italic type characters can be abbreviated.

G15	POS-DEV check VALID		
G16	POS-DEV check INVALID		
A	Rotation angle	Setting unit	deg
		Setting range	± 999.999
			In incremental
			0 359.999
			In absolute
F	Rotation speed	Setting unit	0.01min^{-1}
		Setting range	0.3 9999
D	Equal dividing number	Setting range	0 999
J	Program jump destination	Setting range	-1 999
		J-1	Subprogram return command

Description   Addresses A, F, D and J are the same as "Non-G code Type (Standard)".

Timing chart　　In G15 unused

Program examples
N000　G08
N001　A360 D3 F0
N002　G09

Start

Rotation

Clamped　　　　　　　　　　　　　　　　　　Unclamp
　　　　　　　　　　　　　　　　　　　　　　Clamp

BLKFIN　In case of PRM035=0, BLKFIN is turned OFF at START OFF.
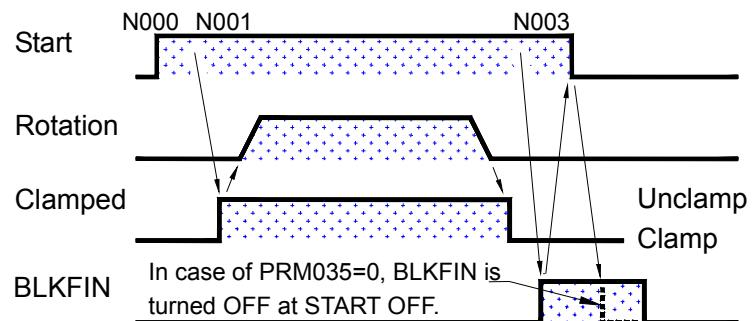
In G15 used

Program examples
N000　G08
N001　G15
N002　A360 D3 F0
N003　G16
N004　G09

Start

Rotation

PRM010

Clamped　　　　　　　　　　　　　　　　　　Unclamp
　　　　　　　　　　　　　　　　　　　　　　Clamp

BLKFIN　In case of PRM035=0, BLKFIN is turned OFF at START OFF.
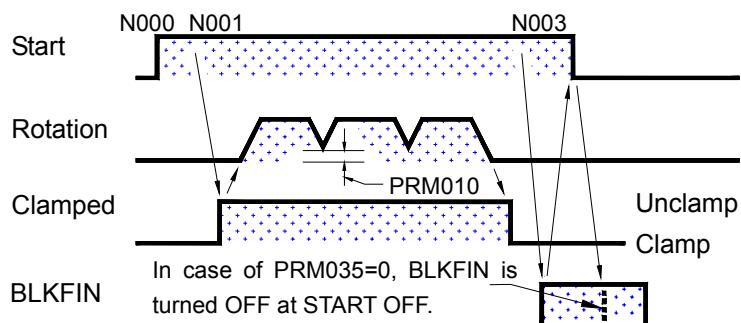
When commanding G15, the table decelerates to the position deviation volume of PRM010 set value or less after dividing completely at the joint between blocks or operations. The table checks that the position deviation volume becomes PRM010 set value or less and it shifts a next operation without stopping.

4.5.7.   INTERLOCK START

The INTERLOCK START command (G21) can be synchronized with the external equipment simply by outputting BLKFIN when operation is started.

Program Format

G21   A   _F_   _L_   _J_   Boldface and italic type characters can be abbreviated.

G21	Interlock start		
A	Rotation angle	Setting unit	deg
		Setting range	± 999.999
			In incremental
			0 359.999
			In absolute
F	Rotation speed	Setting unit	0.01min⁻¹
		Setting range	0 3 9999
L	G99FIN	Setting value	99
J	Program jump destination	Setting range	-1 999
		J-1 Subprogram return command	

Description

Address L (G99FIN)

● Setting value of Address L is only 99.

● The G99FIN is outputted by specifying L99 in G21 command when the operation is started. However, when L99 is specified, BLKFIN does not output.

Addresses A, F, and J are the same as "Non-G code Type (Standard)".

Precautions on 2-axis spec.   When commanding G21, 2-axis specifications are limited to the following items.

➢ In the block commanding G21, only G21 can be commanded to another axis.

If commands except G21, G21L99 are issued, "Err962 EDIT ELLIAGAL G" occurs.

Inadequate program example

Prg.G21-1   If command except G21, G21L99 is issued to the axis that is different as the axis commanding G21.

/A/G21A360F0**/B/A90F0**

/A/A360F0/B/G21A90F0

Concerned parameters

PRM042   Selects VALID/INVALID of delay timer of BLKFIN/G99FIN in G21 command.

0	Delay timer PRM043 INVALID
1	Delay timer PRM043 VALID

PRM043   Sets the delay time of output signal of BLKFIN or G99FIN in G21 execution.

> Precautions
> 1. Though PRM043 can be set from 0.00sec., it takes about 10 ~ 20msec., of time for internal processing.
>   Therefore, even if PRM043<0.02 is set, the system cannot output BLKFIN according to the set time.

Timing chart

In case of PRM042=0 ~ or PRM042=1 , PRM043<0.02 ~ Delay time 20msec ~ .
Program   N000   G21 A360 F0
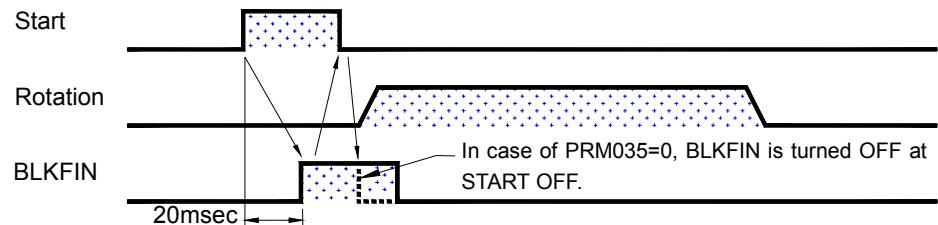
In case of PRM035=0, BLKFIN is turned OFF at START OFF.

20msec

In case of PRM042=1 , PRM043=100 ~ Delay time 1sec
Program   N000   G21 A360 F0

In case of PRM035=0, BLKFIN is turned OFF at START OFF.

20msec

1000msec

PRM035
(STD Set Value: 500msec)

G21 L99 command

In case of PRM042=0　or　PRM042=1　, PRM043<0.02　Delay time　20msec　.

Program   N000   G21 A360 F0 L99

Start

Rotation

BLKFIN

G99FIN

20msec

PRM036
(STD Set Value: 500msec)

G21 L99 command

In case of　PRM042=1　, PRM043=100　Delay time　1sec　.

Program   N000   G21 A360 F0 L99

Start

Rotation

Clamp Output

BLKFIN

G99FIN

20msec

PRM036
(STD Set Value: 500msec)

1000msec
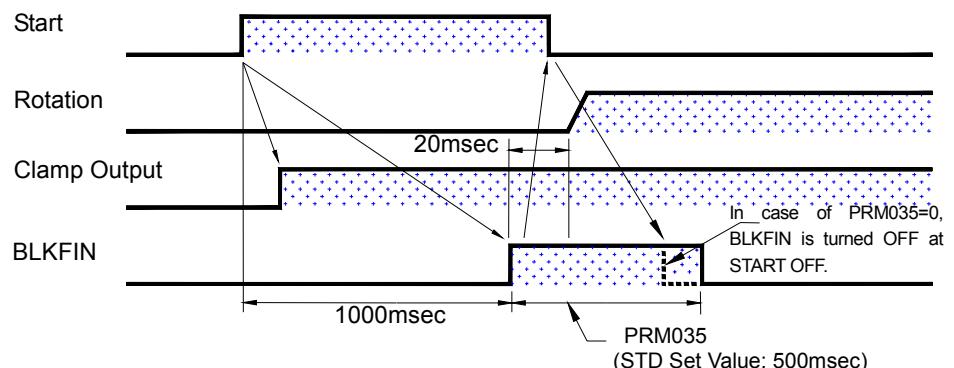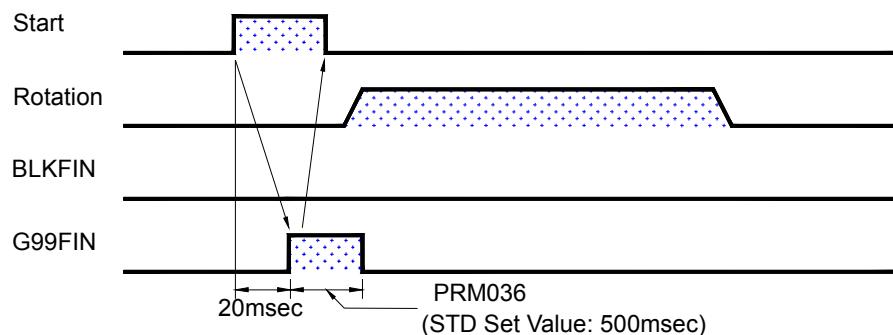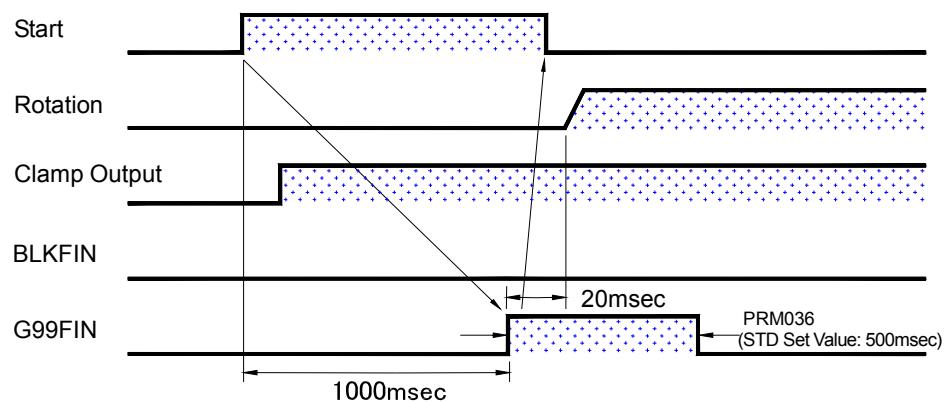
4.5.8.   CONT. START

The ST signal rotates the table at "Rotary Direction" and "Feedrate" specified in continuous start command (G22) and a next signal stops the table.

At this time, BLKFIN is outputted once in ST for first start, and also, once in ST for stop.

When Addresses A and F are not specified for G22 command, the rotary direction and the feedrate are determined by PRM040 and PRM041.

Program Format

G22   *A*   *F*   *J*   Boldface and italic type characters can be abbreviated.

G22	Cont. start		
A	Rotary direction	Setting range	0 -0
F	Rotation speed	Setting unit	0.01min^{-1}
		Setting range	0 3 9999
J	Program jump destination	Setting range	-1 999
		J-1 Subprogram return command	

Description

Address A (Rotary Direction)

- The rotary direction is set with "0" or "-0".

    0   The table rotates in CW direction.

    -0   The table rotates in CCW rotation.

- Though Address A can be abbreviated, if it is abbreviated, the table rotates in the direction set to PRM040.

Address F (Rotation speed)

- Though Address F can be abbreviated, if it is abbreviated, the table rotates in the rotation speed set to PRM041.

Address J is the same as "Non-G code Type (Standard)".

Precautions on 2-axis spec.

When commanding G22, 2-axis specifications are limited to the following items.

➢ In the block commanding G22, only G22 can be commanded to another axis or any code cannot also be set.

  When the command except G22 is issued, "Err962 EDIT ELLIAGAL G" occurs.

Inadequate program example

Prg.G22-1   In G22 command block, if other axis issues the command G22 or non-setting.

/A/G22**/B/A180.000**

/A/A180.000/B/G22

Concerned parameters   PRM040   Selects the table rotary direction in G22 command.

                                           0   CW direction

                                           1   CCW direction

        PRM041   Sets the table rotation speed in G22 command.

Timing chart   In case of G22 command   PRM040=1   ,   PRM041=16.66.

Program   N000   G22 A0 F0   PRM040   PRM041: INVALID
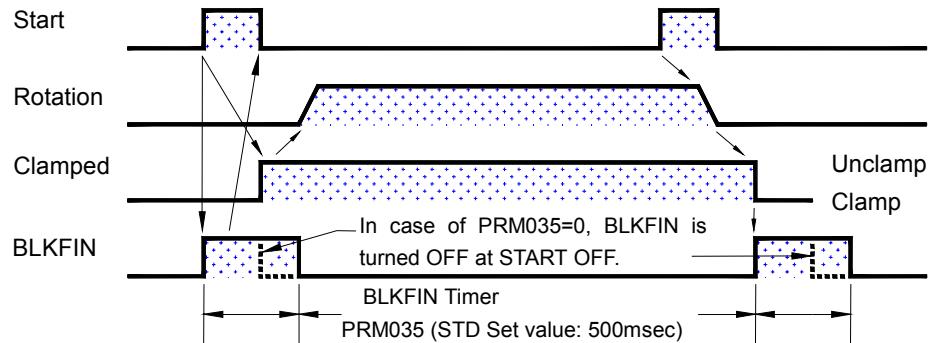
In case of G22 command   PRM040=1   ,   PRM041=16.66

Program   N000   G22   PRM040   PRM041: INVALID
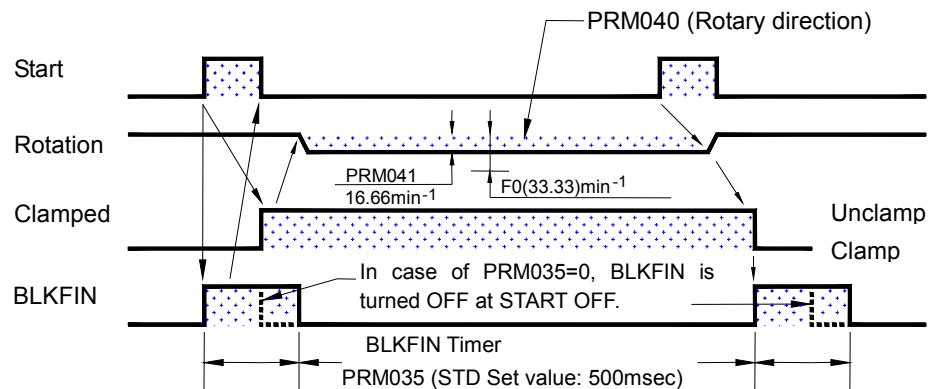
Precautions

1.   When the start signal is except one shot type, do not use G22 at the space between G08 and G09.

Though G22 command controls the table start and stop, because BLKFIN is outputted only first or last one time when G22 is used inside of G08 and G09, the start signal does not turn OFF on the start signal OFF type (a general M-signal type) by BLKFIN OUTPUT confirmation.

4.5.9. Machine zero return   MZRN

This code rotates the table to the mechanical zero position. This is called MZRN.

When MZRN is finished, ZRNFIN and BLKFIN signals are outputted.

The G23 code rotates the table at the rapid traverse set to PRM003 as MZRN feed.

Though MZRN direction is set to PRM016, when SHOT CUT ZRN of PRM017 is set, PRM017 takes precedence.

When G23 is commanded at MZRN position, MZRN is performed again and BLKFIN and ZRNFIN are outputted. However, when UNIDIRECTIONAL is valid, the unidirectional motion is performed.

Program Format

G23   *J*

Boldface and italic type characters can be abbreviated.

G23	Machine zero return (MZRN)	
J	Program jump destination	Setting range -1 999
		J-1 Subprogram return command

Description

Address J is the same as "Non-G code Type (Standard)".

Concerned parameters

| PRM003 | The MZRN feed is rapid traverse. |

PRM016	Selects MZRN direction.
	0 CW direction
	1 CCW direction

PRM017	Selects ZRN SHORT CUT DIR.
	0 INVALID
	1 VALID
	2 ZRN SHORT CUT DIR VALID of OPT POS spec. type

| PRM018 | Sets the angle position (M/C coordinate system) that is the boundary of ZRN SHORT CUT DIR of OPT POS spec. type. |

Timing chart

4.5.10.	Work zero return WZRN

G24 code rotates the table to the Work ZERO position. This is called WZRN.

This code rotates the table at the rapid traverse set to PRM003 as WZRN feed.

When WZRN is finished, 360FIN and BLKFIN signals are outputted.

Though WZRN direction is set to PRM016, when SHORT CUT ZRN of PRM017 is set, PRM017 takes precedence.

When G24 is commanded at WZRN position, WZRN is performed again and BLKFIN and 360FIN are outputted. However, when UNIDIRECTIONAL is valid, the unidirectional motion is performed.

Program Format

G24   *J*

Boldface and italic type characters can be abbreviated.

G24	Work zero return (WZRN)		
J	Program jump destination	Setting range -1 999 J-1 Subprogram return command	

Description

Address J is the same as "Non-G code Type (Standard)".

Concerned parameters

PRM003   The WZRN feed is rapid traverse.

PRM017   Selects ZRN SHORT CUT DIR.

    0   INVALID

    1   VALID

    2   ZRN SHORT CUT DIR VALID of OPT POS spec. type

PRM018   Sets the angle position (M/C coordinate system) that is the boundary of ZRN SHORT CUT DIR of OPT POS spec. type.

PRM025   Selects the OUTPUT FORM of WZRN position conf. 360FIN .

    0   One shot OUTPUT

    1   Area OUTPUT

PRM026   Sets the output range of area output type of WZRN position conf. 360FIN .

Timing chart

<u>In case of PRM025=0　Standard　One shot output　.</u>

Start

Rotation

Clamped

PRM003

Unclamp

Clamp

BLKFIN   In case of PRM035=0, BLKFIN is turned OFF at START OFF.

BLKFIN Timer
PRM035 (STD Set value: 500msec)

360FIN

WZRN position conf. timer
PRM036 (STD Set value: 500msec)
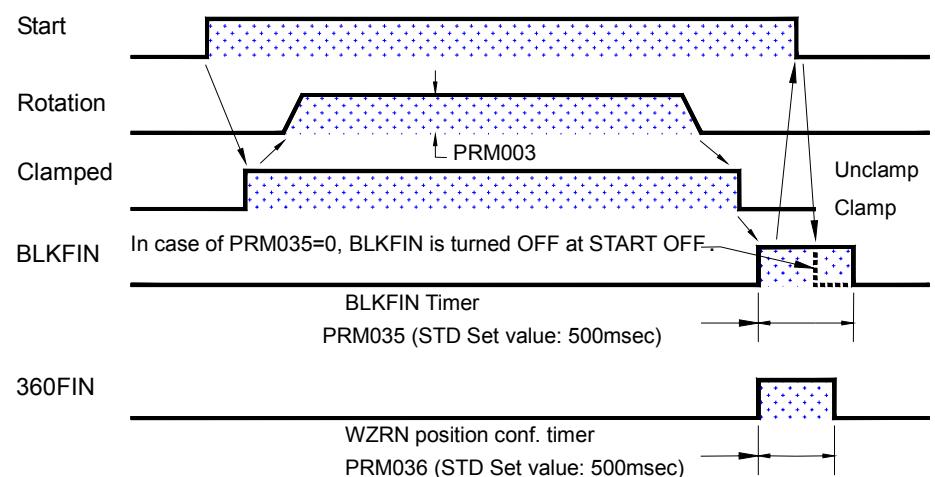
<u>In case of PRM025=1　Area OUTPUT　　PRM026　0.</u>

WZRN position

Start

Rotation

PRM026*2

PRM003

360FIN

WZRN position conf. OUTPUT

(Continuously outputted within area set to PRM026.)

BLKFIN   In case of PRM035=0, BLKFIN is turned OFF at START OFF.

BLKFIN Timer
PRM035 (STD Set value: 500msec)
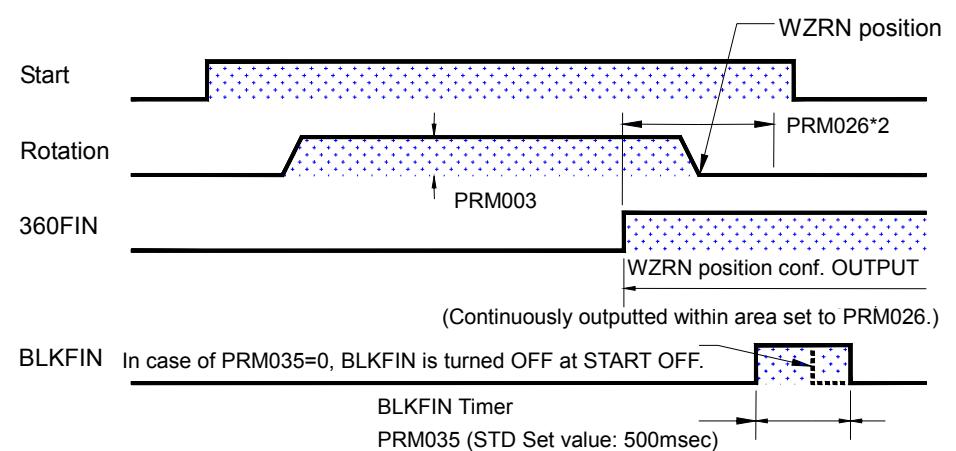
4.5.11. LOOP JUMP

When the table stops at WZRN position or passes it during loop jump command (G25) block execution, the program ignores the jump command inside of G25 command block and shifts to next block.

When the table does not stop at WZRN position or pass it during G25 block operation, the system commands the jump mode in the same block as G25 command and loops the program.

Program Format

G25	**A**	*F*	*D*	J	Boldface and italic type characters can be abbreviated.

G25	Loop jump		
A	Rotation angle	Setting unit	deg
		Setting range	± 999.999
			In incremental
			0 359.999
			In absolute
F	Rotation speed	Setting unit	0.01min^{-1}
		Setting range	0 3 9999
D	Equal dividing number	Setting range	0 999
J	Program jump	Setting range	-1 999
	destination	J-1 Subprogram return command	

Description

Address A (Rotation angle)

- When A is not set, because G25 loop jump becomes impossible, the alarm of   Err962   EDIT ILLEGAL G   Illegal G code   occurs.
- Other contents are the same as   Non-G-code type .

Address J (Jump)

- When J is not set, G25 command becomes invalid and the program shifts to next block after BLKFIN.
- When block No., is set to J, the program jumps to specified block No., after BLKFIN.

Addresses F and D are the same as "Non-G code Type (Standard)".

Precautions on 2-axis spec.

When commanding G25, 2-axis specifications are limited to the following items.

➢ When commanding G25, both axes perform the loop motion of G25. However, in case G25 command is only either axis, G25 command axis becomes loop OUT. When G25 is commanded to both axes, object axes are both axes. The loop OUT occurs at side where the work zero position is detected at G25 command block in advance.

Program examples

   <u>Prg.G25-1</u>   When A-axis stops at work zero position or passes it, the program advances to N002 and B-axis clears the same term.

N000 /A/A45.000F0 /B/A90.000F0
N001 /A/**G25**A90.000J0 /B/A90.000J0
N002 /A/G24J0 /B/G24

   <u>Prg.G25-2</u>   When B-axis stops at work zero position or passes it, the program advances to N002 and A-axis clears the same term.

N000 /A/A90.000F0 /B/A45.000F0
N001 /A/A90.000J3 /B/**G25**A90.000J0
N002 /A/G24J0 /B/G24

   <u>Prg.G25-3</u>   G25 command is for both A and B axes. When either axis stops at work zero position or passes it, the program advances to N002.

N000 /A/A45.000F0 /B/A90.000F0
N001 /A/**G25**A90.000J0 /B/**G25**A90.000J0
N002 /A/G24J0 /B/G24

Program examples

Program	Contents
N000 G24	WZRN
N001 A90.000 F0	Indexes 90° at the rapid traverse of rotation speed.
N002 A30	
N003 G25 A60.000 J2	Indexes 30° at the rapid traverse of rotation speed. The program jumps to N003 when stopping at WZRN and passing it position during this block operation and it jumps to N001 when not stopping at WZRN and passing it.
N004 A45.000 J1	Indexes 45° at the rapid traverse of rotation speed.

In the above program, the loop for G25 command is N002　N03.

Exe. block	Coordinate value WCoordinate
	Start pos.
N000	0.000
N001	90.000
N002	120.000
N003	180.000
N002	210.000
N003	270.000
N002	300.000
N003	0.000
N004	45.000
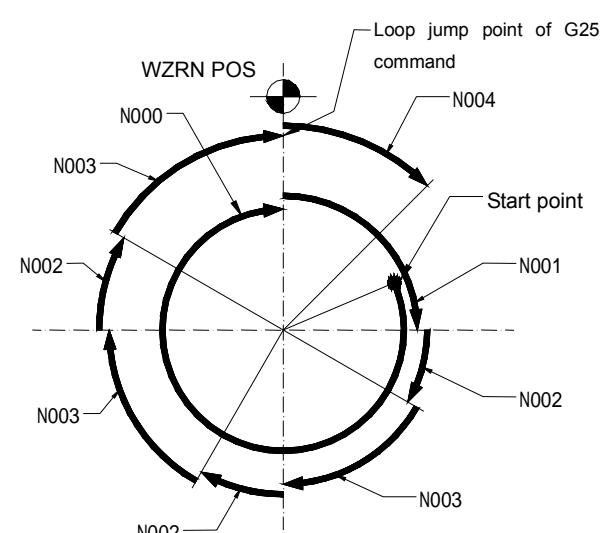
4.5.12.	REPEATING

This repeating command (G27) repeats the program by specified times at place between specified blocks (Repeating start block   Repeating end block).

G27 command can be nested by maximum 8 times (G27 commanded between Repeating start block   Repeating end block specified by G27).

Program Format

G27	**P**	**E**	**L**	*J*	Boldface and italic type characters can be abbreviated.

G27	Repeating command			
P	Repeating program Start block No.	Setting range	1	999
E	Repeating program End block No.	Setting range	1	999
L	Repeating frequency	Setting range	0	999
J	Program jump destination	Setting range	-1	999
		J-1	Subprogram return command	

Description

Address P (START Block No.)

● Address P is an essential setting address.

When there is no P-setting, the alarm of   Err962   EDIT ILLEGAL G
    Illegal G-code   occurs.

● When the set value of Address E is more than that of Address P, the alarm of   Err962   EDIT ILLEGAL G   occurs.

Address E (End Block No.)

● Address E is an essential set-address.

When there is no E-setting, the alarm of   Err962   EDIT ILLEGAL G
    Illegal G-code   occurs.

● When the set value of Address E is less than that of Address P, also, the alarm of   Err962   EDIT ILLEGAL G   occurs.

Address L (Repeating Frequency)

● Address L is an essential set-address.

When there is no L-setting, the alarm of   Err962   EDIT ILLEGAL G
    Illegal G-code   occurs.

In case of L0, it is processed as l1.

Addresses J is the same as "Non-G code Type (Standard)".

Precautions on 2-axis spec.   When commanding G27, 2-axis specifications are limited to the following items.

➢   When commanding G27, it is inputted to only either axis. When any program is inputted to the axis that is different as G27 command axis, "Err962 EDIT ELLIAGAL G" occurs.

Program examples
Prg.G27-1   Though G27 is commanded to the program of A-axis, it is for both A and B axes.

N000 **/A/G27**P10E12L3
N001 /A/G24J0
N010 /A/A10.000F0
N011 /A/A5.000 /B/A15.000F0
N012 /A/A30.000

Prg.G27-2   Though G27 is commanded to the program of B-axis, it is for both A and B axes.

N000 **/B/G27**P10E12L3
N001 /B/G24J0
N010 /A/A10.000F0
N011 /A/A5.000 /B/A15.000F0
N012 /A/A30.000

Inadequate program example   G27 command block is inadequate.

N000 **/A/G27**P10E12L3 **/B/G27**P20E25L5

N000 /A/G27P10E12L3 **/B/A5F0**

N000 **/A/A5F0** /B/G27P10E12L3

Program examples

Program	Contents
N000 G24	WZRN
N001 G27 P50 E51 L3	After repeating N050~N051 blocks 3 times by G27 command, the program shifts to N002.
N002 G24	WZRN
N050 A20.000 F0	Indexes 20° at the rapid traverse of rotation speed.
N051 A40.000	Indexes 40° at the rapid traverse of rotation speed.

In the above programs, loops for G27 are N050   N051.
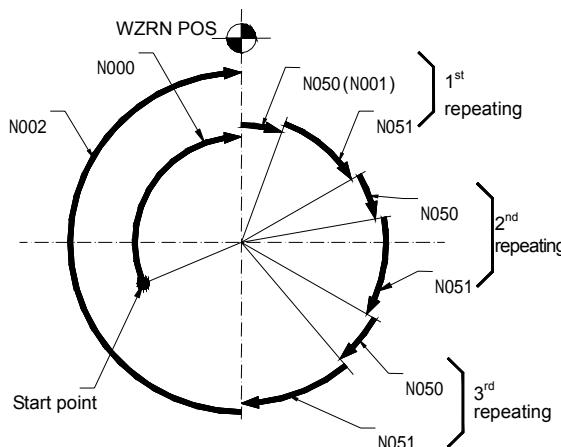

```
N000  G24
N001  G27 P10 E11 L2
N002  G90 A0

N010  A40.000 F0
N011  G27 P20 E21 L2

N020  A30.000 F0
N021  G27 P30 E31 L2

N030  A20.000 F0
N031  G27 P40 E40 L2

N040  A10.000 F0
```

4.5.13.   ABSOLUTE/INCREMENTAL

The absolute command (G90) sets the absolute coordinate on the basis of WZRN position.

The incremental command (G91) sets the relative coordinate on the basis of current position.

Since G90 and G91 are modal commands, unless opposite command　G08⇔G09　is commanded, they are continued continuously.

After power distribution, the incremental command (G91) is set.

When the same coordinate value is specified in the absolute command (G90), the program does not shift, and BLKFIN is outputted. However, when PRM105 (UNIDIRECTIONAL) is set, the unidirectional motion is performed.

Program Format

G90
G91   *A__*   *F__*   *D__*   *J__*   Boldface and italic type characters can be abbreviated.

G90	Absolute command		
G91	Incremental command		
A	Rotation angle	Setting unit	deg
		Setting range	± 999.999
			In incremental
			0 359.999
			In absolute
F	Rotation speed	Setting unit	0.01min⁻¹
		Setting range	0 3 9999
D	Equal dividing number	Setting range	0 999
J	Program jump destination	Setting range	-1 999
		J-1 Subprogram return command	

Description   Addresses A, F, D and J are the same as "Non-G code Type (Standard)".

Notices   Input the new G-code for changing the code of incremental and absolute in each case, there are those code in each channel.

(For Ex.)   **CH00** is performed the <u>absolute</u> instructions, and **CH01** is performed the <u>incremental</u> instructions.

CH00		CH01	
N000	*G90* A125 F0	N000	*G91* A125 F0
N001	A199	N001	A199
N002	A161 J0	N002	A161 J0

Program check

Start pos.	Exe. program	Stop position	
		G90 Abso.	G91 Incr.
A180.000	A 90	Rotates 270° in CW and stops at 90° pos.	Rotates 90° in CW and stops at 270° pos.
	A-90	Rotates 90° in CCW and stops at 90° pos.	Rotates 90° in CCW and stops at 90° pos.
	A 180	Not rotated. Note 1	Rotates 180° in CW and stops at 0° pos.
	A-180	Not rotated. Note 1	Rotates 180° in CCW and stops at 0° pos.
	A 0	Rotates 180° in CW and stops at WZRN position.	Not rotated. Note 1
	A-0	Rotates 180° in CCW and stops at WZRN position.	Not rotated. Note 1

All coordinate systems show stop positions.

Note 1. When the UNIDIRECTIONAL positioning is set, the approach amount of unidirectional positioning varies.

Program examples

(Executed programs ①, ②, ③ are compared with the above programs.)

G90 Abso. command	G91 Incr. command
G90 A90	G91 A90
G90 A-90	G91 A-90
G90 A0	G91 A0
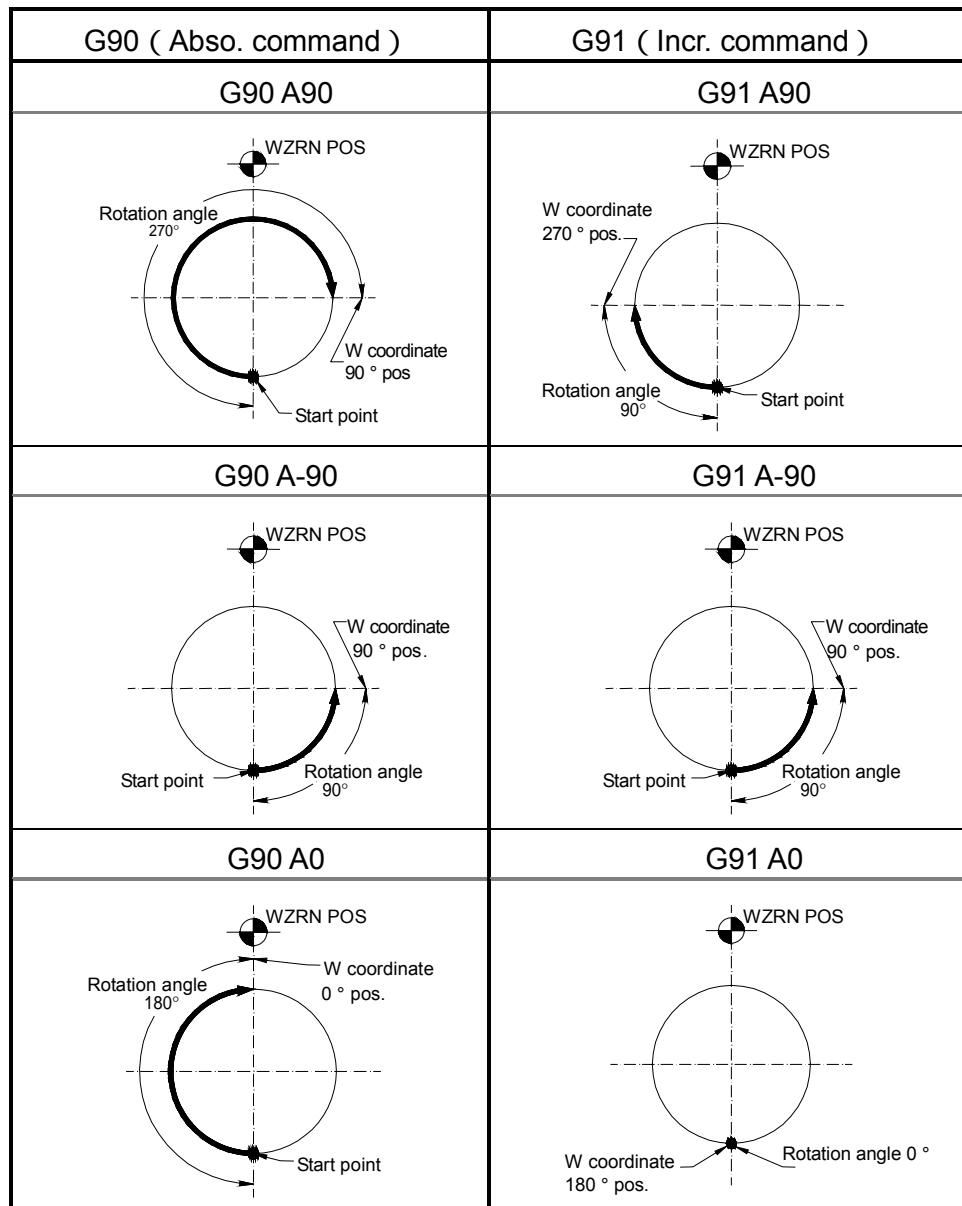
4.5.14.   WCRT SYS SET

The work coordinate system setting command (G92) can set that the current position is changed to which position.

Precautions

1. The WZRN position set by G92 command can be changed by G92 command after that, or a manual WZRN position. The WZRN position data is not remained before change.

Program Format

G92	**A**	*J*	Boldface and italic type characters can be abbreviated.

G92	Work coordinate system setting command		
A	Setting angle	Setting unit	deg
		Setting range	0 359.999
J	Program jump destination	Setting range	-1 999
		J-1 Subprogram return command	

Description

Address A (Setting Angle)

- The set-value of WZRN position can be changed by setting that the currently stopped position is determined to which position.
- When setting over the set range, the alarm of   Err944   PROG A ERROR   Program A-address input error   occurs.

Address J is the same as "Non-G code Type (Standard)".

Program examples

Program				Conents
N000	G24			WZRN
N001	G90	A90.000	F0	Indexes 90° pos., at rapid traverse on the basis of WZRN.
N002	G92	A0		Sets current pos. to 0° from WZRN pos.
				Current pos. is regarded as WZRN.

Exe. block	Coordinate value WCoordinate
	Start pos.
N000	0.000
N001	90.000
N002	0.000
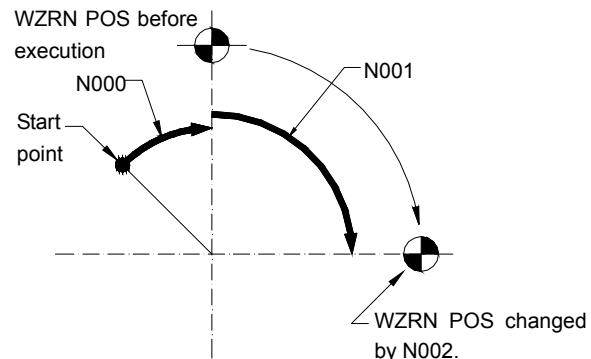
Program				Conents
N000	G24			WZRN
N001	G90	A90.000	F0	Indexes 90° pos., at rapid traverse on the basis of WZRN.
N002	G92	A180		Sets current pos. to 180° from WZRN pos.
N003	A-270	J0		Indexes 270° pos., at rapid traverse in CCW on the basis of WZRN.

Exe. block	Coordinate value WCoordinate
	Start pos.
N000	0.000
N001	90.000
N002	180.000
N003	270.000
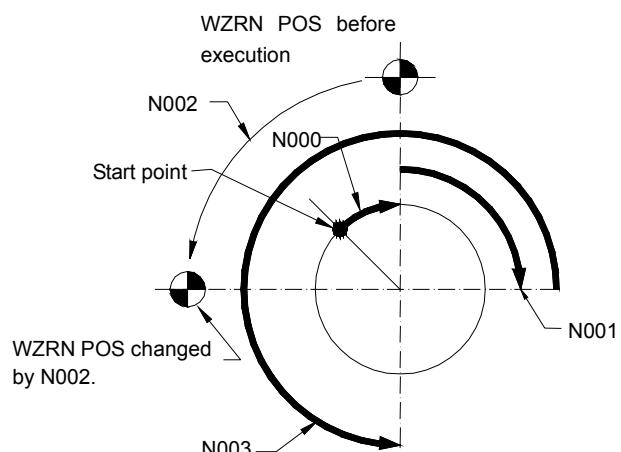
4.5.15.   BLKFIN NON-OUTPUT

BLKFIN NON-OUTPUT command (G97) does not output BLKFIN on the usual program execution.

When operating the circular table by interlocking with the machine, this command is not used usually. This code is used for operating the circular table independently without operating environment equipment by BLKFIN output.

Precautions

1. Since the G97 does not output the BLKFIN for ST input from external equipment, when the external start signal is turned OFF at FLKFIN OFF, the external equipment waits the FIN signal, thus stopping as is.

Program Format

| **G97** | **A** | *F* | *D* | *J* | Boldface and italic type characters can be abbreviated. |

G97	BLKFIN NON-OUTPUT command		
A	Rotation angle	Setting unit	deg
		Setting range	± 999.999
			In incremental
			0 359.999
			In absolute
F	Rotation speed	Setting unit	$0.01min^{-1}$
		Setting range	0 3 9999
D	Equal dividing number	Setting range	0 999
J	Program jump destination	Setting range	-1 999
		J-1	Subprogram return command

Description   Addresses A, F, D and J are the same as "Non-G code Type (Standard)".

Precautions on 2-axis spec.   When commanding G97, 2-axis specifications are limited to the following items.

> ➢ In the block commanding G97, when another axis is programmed without G code, G97 is set to both axes and finish signal is not outputted.

> ➢ If G97 is commanded to another axis in the block that commands G97, Err962 EDIT ELLIAGAL G   occurs.

Inadequate program example
>   Prg.G97-2   G97 is commanded to each axis and G98 to another axis.

>   /A/G97A360F0/B/**G98**A90F0

>   /A/**G98**A360F0/B/G97A90F0

Timing chart
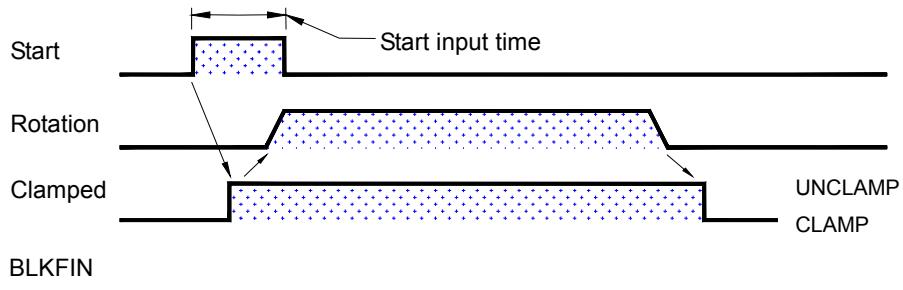
4.5.16.   (Block finish output (BLKFIN)/optional block finish output (G99FIN))

The BLKFIN and G99FIN command (G98) outputs the BLKFIN and G99FIN.

```
Program Format
    G98    A    F    D    J        Boldface and italic type characters can be
                                   abbreviated.

    G98         BLKFIN/G99FIN output command
    A           Rotation angle        Setting unit       deg
                                      Setting range      ± 999.999
                                                            Incremental
                                                         0      359.999
                                                            In absolute
    F           Rotation speed        Setting unit       0.01min⁻¹
                                      Setting range      0  3      9999
    D           Equal dividing number Setting range      0       999
    J           Program jump          Setting range      -1       999
                destination           J-1      Subprogram return command
```

Description   Addresses A, F, D and J are the same as "Non-G code Type (Standard)".

Precautions on 2-axis spec. When commanding G98, 2-axis specifications are limited to the following items.

  ➢ If G97 is commanded to another axis in the block that commands G98, Err962 EDIT ELLIAGAL G   occurs.

  ➢ If G97 is commanded to another axis in the block that commands G99, Err962 EDIT ELLIAGAL G   occurs.

Inadequate program example

  Prg.G98-1   G98 is commanded to each axis and G97 to another axis.

      /A/G98A360F0/B/**G97**A90F0
      /A/**G97**A360F0/B/G98A90F0

  Prg.G98-2   G98 is commanded to each axis and G99 to another axis.

      /A/G98A360F0/B/**G99**A90F0
      /A/**G99**A360F0/B/G98A90F0

Concerned parameters | PRM027 | Selects the timing of G99FIN OUTPUT.

                     0   Outputs G99FIN in BLK execution start.

                     1   Outputs G99FIN in BLK execution finish.

| PRM028 | In case of PRM029=2, though G99FIN OUTPUT and ZRN INPUT signals are used as handshake signals, the time to cause an alarm is set when ZRN signal is not received in time after outputting G99FIN.

During this set time, G99FIN is outputted continuously.

| PRM029 | Specifications of ZRN INPUT are set.

                     0   Outer MZERO (Machine zero return) spec.

                     1   Outer WZERO (Work zero return) spec.

                     2   Handshake check spec.

Timing chart

In case of usual operation.
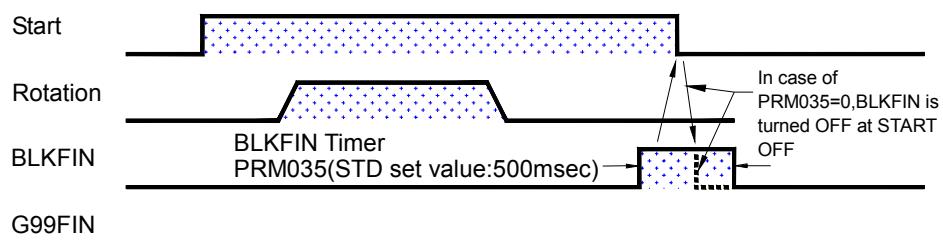
In case of G98 command   PRM027=0   PRM029   2   .
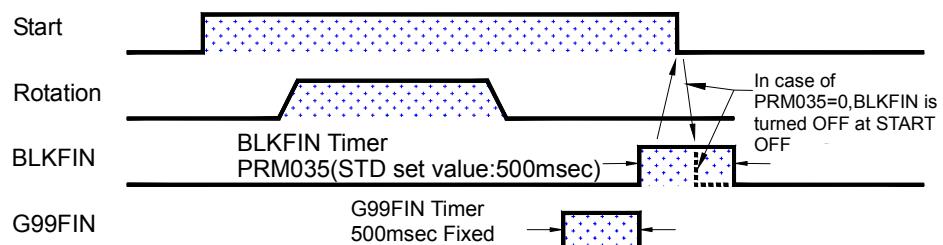
In case of G98 command   PRM027=1   PRM029   2   .
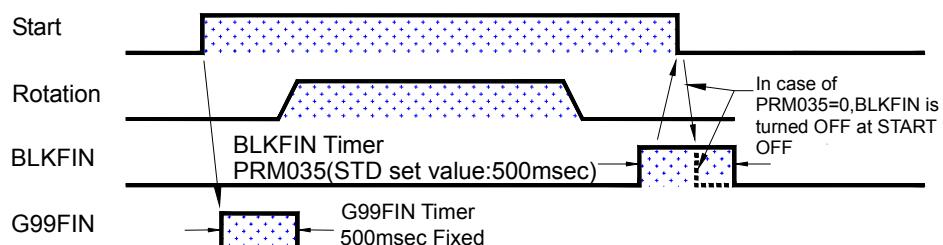
PRM027=1   PRM028=5.0   PRM029=2   When ZRN is inputted within 5 sec.
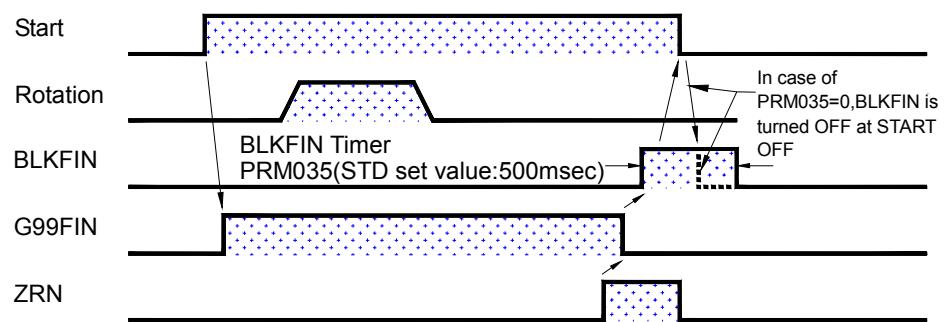
PRM027=1   PRM028=5.0   PRM029=2   When ZRN is inputted within 5 sec.
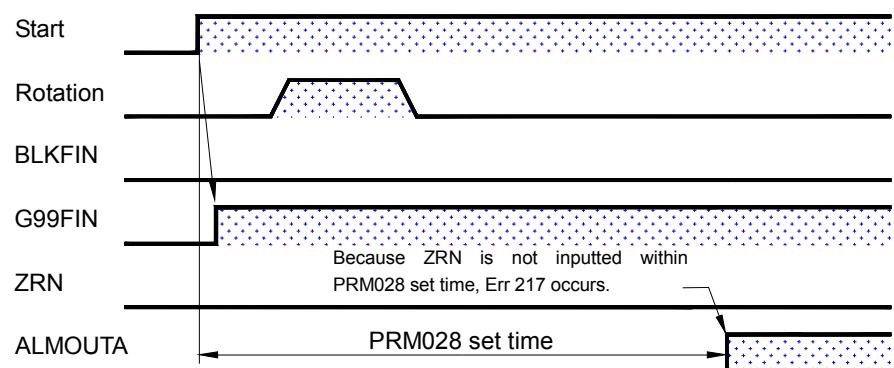
4.5.17.   (Optional block finish output (G99FIN OUTPUT))

G99 command outputs G99FIN on the program execution. At this time, it does not output the BLKFIN.

Program Format

G99	*A*	*F*	*D*	*J*	Boldface and italic type characters can be abbreviated.

G99	G99FIN OUTPUT command		
A	Rotation angle	Setting unit	deg
		Setting range	± 999.999
			In incremental
			0 359.999
			In absolute
F	Rotation speed	Setting unit	0.01min^{-1}
		Setting range	0 3 9999
D	Equal dividing number	Setting range	0 999
J	Program jump destination	Setting range	-1 999
		J-1 Subprogram return command	

Description   Addresses A, F, D and J are the same as "Non-G code Type (Standard)".

Precautions on 2-axis spec. When commanding G99, 2-axis specifications are limited to the following items.

> If G99 is commanded to another axis in the block that commands G99,   Err962 EDIT ELLIAGAL G   occurs.

Program example
Prg.G99-1   G99 is commanded to each axis and G98 to another axis.

/A/G99A360F0/B/**G98**A90F0
/A/**G98**A360F0/B/G99A90F0

Concerned parameters | PRM027 | Selects the timing of G99FIN output.

0   Outputs G99FIN in block execution finish.

1   Outputs G99FIN in block execution start.

| PRM028 | In case of PRM029=2, though G99FIN OUTPUT and ZRN INPUT signals are used as handshake signals, the time to cause an alarm is set when ZRN signal is not received in time after outputting G99FIN.

During this set time, G99FIN is outputted continuously.

PRM029   Specifications of ZRN INPUT are set.

0   Outer MZERO   (Machine zero return) spec.

1   Outer WZERO   (Work zero return) spec.

2   Handshake check spec.

Timing chart   In case of G99 command   PRM027=0   PRM029   2   .
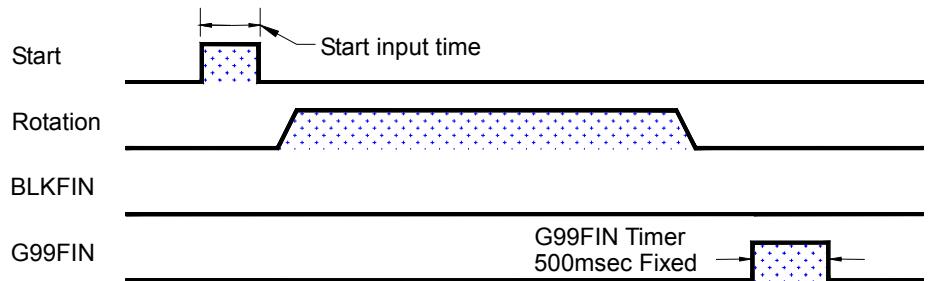
Start — Start input time

Rotation

BLKFIN

G99FIN — G99FIN Timer 500msec Fixed

In case of G99 command   PRM027=1   PRM029   2   .

Start — Start input time

Rotation

BLKFIN

G99FIN — G99FIN Timer 500msec Fixed

PRM027=1   PRM028=5.0   PRM029=2   When ZRN is inputted within 5 sec.

Start — Start input time

Rotation

BLKFIN

G99FIN

ZRN

PRM027=1   PRM028=5.0   PRM029=2   When ZRN is not inputted within 5 sec.

Start — Start input time

Rotation

BLKFIN

G99FIN

ZRN — Because ZRN is not inputted within PRM028 set time, Err 217 occurs.

ALMOUTA — PRM028 Set time

4.6.   Dividing Feed Function

This is the function to divide the optional angle uniformly by optional dividing number.

4.6.1.
Dividing feed

N000 G91 A120 D4 F0	Exe.
N001 A120	
N002 A90 D6	Exe.
N003 A30 J0	

Divides angle of 120° into 4 and indexes 30° four times.

Divides angle of 90° into 6 and indexes 15° six times.

Timing chart

Start signal

Rotary motion

BLKFIN signal
PRM020=1

N000   N001   N002   N003
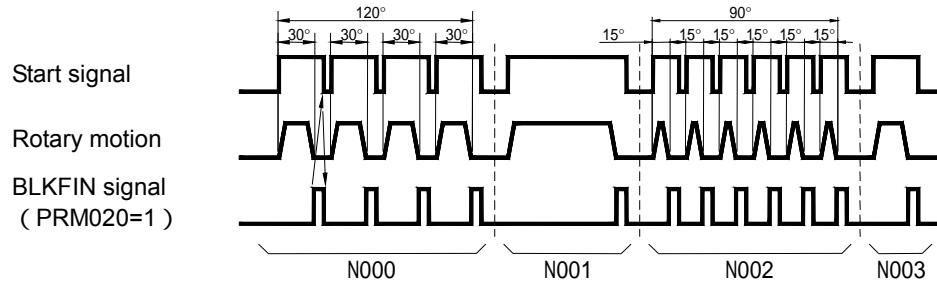
Precautions

N000 block operates four times before advancing to N001. Similarly, N002 block operates six times before advancing to N003.

It is necessary to start the operation in the dividing command block.

When the relationship between angle command (A) and dividing command (D) is less than a minimum shift unit as shown in the following formula,   Err207 DIVIDE COMMAND ERROR   occurs.

Angle Command (A) / Dividing Command (D)   Minimum Shift Value (0.001°)

When the dividing command (D) is 0 or 1, the block shifts as non dividing command.

When the dividing shift command is not divided out within 3 digits of decimal point or less, the block shifts so that its error will be minimum value.

See a right figure.

Example   N001 A80.000 D6
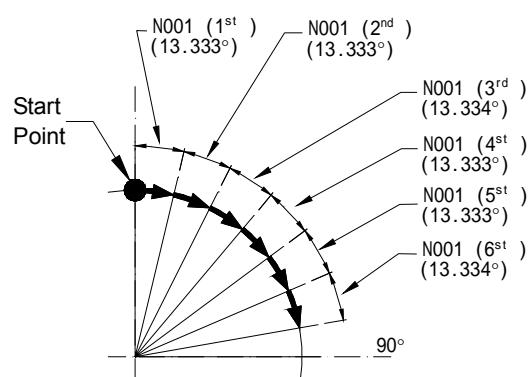
4.7.   Subprogram Function

When there is a repeating index mode into the program, this program can be simply used as the subprogram, which can be called out of the main program.

4.7.1.
Subprogram structure   N***

N***   J-1   Commands J-1 (Return command) as sub-program completion.

4.7.2.
Subprogram example

N000	A90.000 F0	
N001	J10	Exe.
N002	A90.000	
N003	J10	Exe.
N004	G24 J0	
N010	A10.000 F0	
N011	A20.000	
N012	A30.000 J-1	
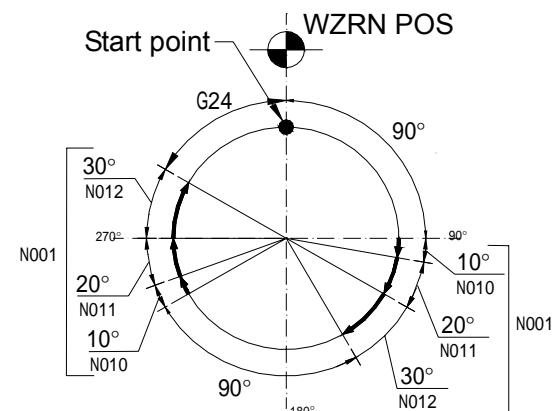
The program jumps by execution of N001 and after executing N010   N012, the program proceeds to N002.

In case of   , it also is the same as the above.

Timing chart
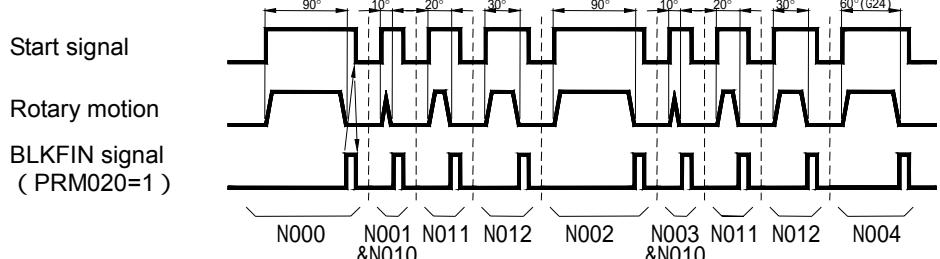
Precautions

An additional subprogram cannot be called (subroutine call) out of the subprogram. When the program is called, the alarm of   Err203   STACK OVER FLOW   occurs.

When J-1 (Return command) is executed without subroutine call, the alarm of   Err202   STACK UNDER FLOW   occurs.

When J-1 (Return command) is not executed on a final block executed after calling the subroutine, the alarm of   Err204   NOT RETURN ALARM   occurs.

5   Program Operation

5.1.   Channel call

To call the program to be selected, select the channel.

5.1.1.
Channel call

The following describes the steps changing from channel No. "0" to "7".

MODE

➔ Since each MODE is changed in order by pushing **MODE** , push this button until EDIT is selected (LED lighting) several times.

0_{CH} 7_G ENT

The channel select screen is displayed in **CH** input.

CH00   7

Channel Select Screen

After inputting **ENT** , the program initial screen on the channel destination is displayed.

CH07 /A/G   A
N000 F   D   J

Initial Screen in EDIT Selection

5.2.   Block number call

Calls the block to be selected.

5.2.1.
Former block call $\boxed{3_{N}}$ ➜ Calls the block just before current block.

5.2.2.
Next block call $\boxed{N_{+}}$ ➜ Calls the next block of current block.

5.2.3.
Block number call $\boxed{-_{N}}$ ****** $\boxed{\text{ENT}}$ ➜ Specifies the block No. to [**] part and calls
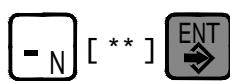
the number directly.

5.3.   Program INPUT (for 1-axis)

The following explains the steps to input the program for 1-axis.

5.3.1.
Program examples
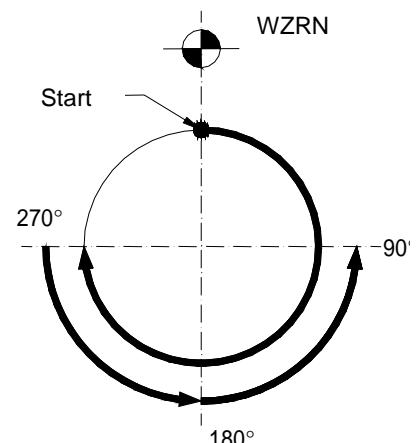
CH07

N000	G90 A270 F0	Exe.
N001	A-180 F500	Exe.
N002	G91 A-90 J0	Exe.

The absolute command functions the angle position command from the WZRN position (G90).

The table shifts to the angle position to be 270° from WZRN position. (A270)

The table rotates at the rapid traverse. (F0)

The table rotates to the angle position to be 180° from WZRN in reverse direction (A-180).

The table rotates at $5min^{-1}$. (F500)

The incremental command functions as the relative command from the current position. (G91)

The table rotates 90° from the current position in reverse direction. (A-90)

After executing the program, the program returns to N000 block. (J0)

For N001 block, G90 (Absolute command) of N000 is continued.

When there is no rotation speed command as well as N002, the rotation speed commanded at a former block is continued.

5.3.2.
Program input examples

The inputting steps of the above program examples are as follows:

1) [MODE]
➔ Since each MODE is changed in order by pushing **MODE**, push this button until EDIT is selected (LED lighting) several times.

2) [O$_{CH}$] [7$_G$] [ENT]
➔ Calls channel No. "7".
Block N000 is called when the channel No. is called.

3) [7$_G$] [ENT]
➔ The under bar is displayed under the character G when **G** is inputted.
After inputting **ENT**, Address G flickers and the value can be set.

4) 9_J 0_H [ENT] ➔ 90 is inputted in Address G and it lights.
At this time, character /A/ flickers. [1]

5) 8_A [ENT] ➔ When inputting | A |, the under bar is displayed under the character A .
After inputting | **ENT** |, Address A flickers and the value can be set.

6) 2_L 7_G 0_H [ENT] ➔ 270 is inputted in Address A and it lights.

7) 5_F [ENT] ➔ When inputting | F |, the under bar is displayed under the character F .
After inputting | **ENT** |, Address F flickers and the value can be set.

8) 0_H [ENT] ➔ 0 is inputted in Address F and it lights.

9) N ➔ Calls N001 block adding +1 to N000.

10) 8_A [ENT]

11) $-_N$ 1_E 8_A 0_H [ENT]

12) 5_F [ENT]

13) 5_F 0_H 0_H [ENT]

14) N

15) 7_G [ENT]

16) 9_J 1_E [ENT]

17) 8_A [ENT]

18) $-_N$ 9_J 0_H [ENT]

19) 9_J [ENT] ➔ When inputting | J |, the under bar is displayed under the character J .
After inputting | **ENT** |, Address J flickers and the value can be set.

20)   ➔   0   is inputted in Address J and it lights.

The program block is stored.

21)   ➔   Stores the block of program.

When /A/ flickers during program EDIT, it shows that the program is changed. While flickering of /A/ , the changed program is not stored into the memory. The timing that the program is stored is when the following operations are performed:

- When block change is operated by   N+   N- .
- When block No. is called by   N   ∗   ENT .
- When forcedly written by   INPUT .
- When the mode is changed by   MODE .

Therefore, the data is stored into memory every block shift during program EDIT. However, the power is turned OFF while flickering of /A/ or RESET is pushed, the program returns to the state before changing.

5.4.   Program INPUT (for 2-axis)

The following explains the steps to input the program for 2-axis.

5.4.1.
Program examples
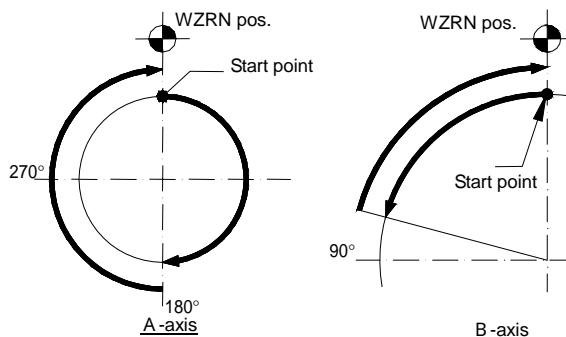
CH07

N000	G90 A270 F0	Exe.
N001	A-180 F500	Exe.
N002	G91 A-90 J0	Exe.

The following content is commanded to A-axis.

The absolute command functions the angle position command from the WZRN position (G90).

The table shifts to the angle position to be 270° from WZRN position. (A270)

The table rotates at the rapid traverse. (F0)

The following content is commanded to A-axis.

The absolute command functions the angle position command from the WZRN position (G90).

The table rotates 75° from the WZRN position in reverse direction. (A-75)

The table rotates at 5min^{-1}. (F500)

The following content is commanded to A-axis.

MZRN is commanded. (G23)

The following content is commanded simultaneously to B-axis.

MZRN is commanded. (G23)

After executing the program, the program returns to block N000. (J0)

5.4.2.
Program input examples

The inputting steps of the above program examples are as follows:

1) [MODE]   → Since each MODE is changed in order by pushing **MODE**, push this button until EDIT is selected (LED lighting) several times.

2) [O$_{CH}$] [7$_G$] [ENT] → Calls channel No. "7".

Block N000 is called when the channel No. is called.

3) $\boxed{7_G}$ $\boxed{\text{ENT}}$ ➔ The under bar is displayed under the character G when $\boxed{\text{G}}$ is inputted.

After inputting $\boxed{\text{ENT}}$, Address G flickers and the value can be set.

4) $\boxed{\text{A/B}}$ ➔ Push $\boxed{\text{A/B}}$ to display A-axis to screen.

When A-axis is specified, the LED on upper left on $\boxed{\text{A/B}}$ lights.

5) $\boxed{9_J}$ $\boxed{0_{CH}}$ $\boxed{\text{ENT}}$ ➔ 90 is inputted in Address G and it lights.

At this time, character /A/ flickers. [1]

6) $\boxed{8_A}$ $\boxed{\text{ENT}}$ ➔ When inputting $\boxed{\text{A}}$, the under bar is displayed under the character A.

After inputting $\boxed{\text{ENT}}$, Address A flickers and the value can be set.

7) $\boxed{2_L}$ $\boxed{7_G}$ $\boxed{0_{CH}}$ $\boxed{\text{ENT}}$ ➔ 270 is inputted in Address A and it lights.

8) $\boxed{5_F}$ $\boxed{\text{ENT}}$ ➔ When inputting $\boxed{\text{F}}$, the under bar is displayed under the character F.

After inputting $\boxed{\text{ENT}}$, Address F flickers and the value can be set.

9) $\boxed{0_{CH}}$ $\boxed{\text{ENT}}$ ➔ 0 is inputted in Address F and it lights.
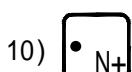
10) $\boxed{N}$ ➔ Calls N001 block adding +1 to N000.
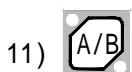
11) $\boxed{\text{A/B}}$ ➔ Push $\boxed{\text{A/B}}$ to display B-axis to screen.

When B-axis is specified, the LED on upper left on $\boxed{\text{A/B}}$ lights.

12) $\boxed{9_J}$ $\boxed{0_{CH}}$ $\boxed{\text{ENT}}$

13) $\boxed{8_A}$ $\boxed{\text{ENT}}$

14) $\boxed{7_G}$ $\boxed{5_F}$ $\boxed{\text{ENT}}$

15) $\boxed{5_F}$ $\boxed{\text{ENT}}$

16) $\boxed{5_F}$ $\boxed{0_{CH}}$ $\boxed{0_{CH}}$ $\boxed{\text{ENT}}$
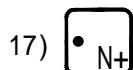
17) [N+]   → Calls N002 block that adds 1 to N001.

18) [A/B]   → Push **A/B** to display A-axis.

19) [7 G] [ENT]

20) [2 L] [3 N] [ENT]

21) [9 J] [ENT]   → When inputting **J**, the under bar is displayed under the character J . After inputting **ENT**, Address J flickers and the value can be set.

22) [0 H] [ENT]   →   0   is inputted in Address J and it lights. The program block is stored.

23) [A/B]   → Push **A/B** to display B-axis.

24) [7 G] [ENT]

25) [2 L] [3 N] [ENT]

26) [INPUT]   → Stores the block of program.

When /A/ flickers during program EDIT, it shows that the program is changed.

While flickering of /A/ , the changed program is not stored into the memory.

The timing that the program is stored is when the following operations are performed:

- When block change is operated by **N+**   **N-** .
- When block No. is called by **N** **∗** **ENT**.
- When forcedly written by **INPUT** .
- When the mode is changed by **MODE** .

Therefore, the data is stored into memory every block shift during program EDIT.

However, the power is turned OFF while flickering of   /A/   or   **RESET** is pushed, the program returns to the state before changing.

5.5.   Program DELETE

The programs such as all programs, every channel, blocks, etc., can be deleted.

5.5.1.
ALL PRG DEL

Deletes all programs in the controller.

1) $\boxed{1_E}$ $\boxed{\text{CL/DGN}}$

    + POWER ON

→ When power is tuned ON, the ALL PRG DEL mode (CL-1) is applied.

$$\boxed{CL\text{-}1}$$

CL-1 Screen

2) $\boxed{\text{ENT}}$

→ When ALL PRG DEL is started, ALL PRG DEL flickers. When ALL PRG END is displayed, the ALL PRG DEL is finished.

When the ALL PRG DEL is finished, the controller START mode is applied continuously.

5.5.2.
PRG DEL in channel

The program is deleted at the channel unit.

1) $\boxed{\text{MODE}}$

→ Selects the EDIT of program EDIT.

2) $\boxed{0_{CH}}$ *∗∗* $\boxed{\text{ENT}}$

→ Calls the channel to delete the program.

3) $\boxed{\text{DEL}}$ $\boxed{\text{CL/DGN}}$

    Pushed for 2 sec. or more.

→ When the left keys are pushed for 2 seconds or more, CH∗∗PRG DEL occurs. When the program is completely deleted, the program returns to the initial screen.

When all programs in the channel are deleted, the N000 of select channel is displayed.

When the program capacity of CH∗∗PRG DEL displayed during program deletion is small, it may not be read because it is only displayed in the blink of an eye.

5.5.3.
1 BLOCK DEL   Deletes a selected block.

1) [MODE] → Selects the   EDIT   of program EDIT.

2) [O CH] ** [ENT] → Calls the EDIT channel.

3) [- N] ** [ENT] → Calls the block to be deleted.

4) [DEL] [ENT] → Block No. flickers by pushing ⎢ **DEL** ⎟.
When pushing ⎢ **ENT** ⎟,   CH** PRG DEL
is displayed and the block is deleted.

The block after deleted block is moved to left.

At this time, the block No., of program that the block No., is specified is

generated automatically.

Before BLK DEL   After BLK DEL

N000   G90 A90.000 F0   N000   G90 A90.000 F0
N001   A180   ◄ DEL   N001   G27 P9 E11
N002   G27 P10 E12   N002   G24 J0   Jump destination No.
N003   G24 J0   automatically generated

                                   N009   G90 A15.000 F1000
N010   G90 A15.000 F1000   N010   A30.000 F2000
N011   A30.000 F2000   N011   A45.000 F0
N012   A45.000 F0   BLK No. after DEL.

During block deletion,   CH** PRG DEL   is displayed.

5.5.4.
1 BLOCK DATA DEL   Deletes each data of select block.

1) [MODE] → Selects of   EDIT   program EDIT.

2) [O CH] ** [ENT] → Calls the channel to be edited.

3) [- N] ** [ENT] → Call the block to be deleted.

4) [CL/DGN] [INPUT] → When left keys are pushed for 2 seconds or
more, CH** PRG DEL is displayed and the
Pushed for 2 sec. or more.   data in the block is cleared.

CH** PRG DEL   is only displayed in the blink of an eye during program

deletion.

5.6.   Program copy

The program can be copied at between channels and on the single block.

5.6.1.
Program copy
between channels

The programs can be copied at between channels.

Though all programs inside of channels can be copied, the part of n-line ~ n-line of block cannot be copied.

1) [MODE] ➔ Select the   EDIT   of program EDIT.
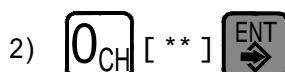
2) [O_CH] ** [ENT] ➔ Select the channel to be an original copy.
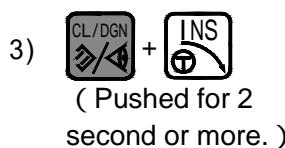
3) [CL/DGN] [INS] ➔ When the left keys are pushed for 2 seconds or
    Pushed for 2   more, the screen of channel copy mode is
    second or more.   displayed.

Copy   OO--OO

Copy Mode Screen

4) [ENT] ➔ The right channel No. that is copying destination is deleted and the value can be set.

5) ** [ENT] ➔ Determines the channel No. of copy destination.

6) [START] ➔ Starts the copy at between channels. During copy, channels Nos., of copy source and copy destination flicker. After a long time,   END   is displayed and the program copy is completed.

All programs in the channels are deleted and the N000 of select channel is displayed.

When the program capacity of   CH**PRG DEL   displayed during program deletion is small, it may not be read because it is only displayed in the blink of an eye.

5.6.2.
1 BLOCK COPY   Copies and inserts the contents of selected block into the next block.

1) [MODE]   → Select the   EDIT   of program EDIT.

2) [O CH] ** [ENT]   → Call the channel to be edited.

3) [- N] ** [ENT]   → Call the block to be copied.

4) [INS] [ENT]   → When pushing **INS** , the block No., flickers.
                          When pushing **ENT** , the block of the same
                          contents is copied into the next block.

Shifts the block after the block that is not copied to the back one by one.
At this time, the block No., of program contents that the block No., is
specified is automatically generated.

Before block copy   After block copy
N000 G90 A90. 000 F0   N000 G90 A90. 000 F0
N001 A180   ◀ Addition   N001 A180. 000
N002 G27 P10 E12   N002 A180. 000   Added block
N003 G24 J0   N003 G27 P11 E13
                                      N004 G24 J0   Automatically generated
                                                          jump-destination No.
N010 G90 A15. 000 F1000   N011 G90 A15. 000 F1000
N011 A30. 000 F2000   N012 A30. 000 F2000
N012 A45. 000 F0   N013 A45. 000 F0

                                          BLK No. after addition

The final block of channel is forcedly deleted.
When there is the program that the final block of channel is specified at the
jump destination and the block is copied at front of its block, the alarm of
『Err961   BLOCK INS ERROR』occurs. Thus, the block is not copied.

6   Operation

6.1.   Emergency stop   O6-1

6.1.1.
To perform
EMERGENCY STOP

. Push the EMERGENCY STOP button on the pendant.

. During the emergency stop,   Err001   EMERGENCY STOP   is displayed on the screen and the table becomes the emergency stop state.

. In the emergency stop state, an alarm is outputted. When the emergency stop button is pushed, the emergency stop mode is outputted to the external equipment.

. During the emergency stop, the main power source of the servo amplifier is turned OFF and the circular table cannot be operated.

6.1.2.
To release
EMERGENCY STOP

※ **Remove the cause of fault before releasing the emergency stop.**

. When the EMERGENCY STOP button is turned to right, the button comes out.

. When pushing ⎡ **RESET** ⎤ on the panel, the emergency stop is released.
It can also be released with the external RESET (RST) button except the panel.

. The alarm OUTPUT and emergency stop OUTPUT outputted during the emergency stop are turned OFF.

. When the emergency stop is released, the main power is supplied to the servo amplifier and the circular table can be operated.

6.2.   Auto run

The following explains the steps to operate the table by the program into the memory automatically.

6.2.1.
Program selection   Select to the program to be operated automatically.

MODE   ➔ When pushing **MODE**, the mode is changed in order. Push this button several times until EDIT   is selected (LED lighting).

O_CH ** ENT   ➔ Select an auto run execution program. When the channel is changed, the block of N000 is selected.

When executed except block No. N000.

- N ** ENT   ➔ Select the auto run execution block.

6.2.2.
Mode selection   Select the AUTO mode to perform the auto run.

MODE   ➔ When pushing **MODE**, the mode is changed in order. Push this button several times until AUTO   is selected (LED lighting).

6.2.3.
Program START   Perform the auto run of program.

When the program is executed from the pendant.

START
[I]   ➔ Automatically operate the program by 1-block currently displayed.
+ ENABLE switch   The ENABLE switch is required only start.
                             Even if operation is released during automatic operation, it does not stop.

When the program is executed from the external signal.

Turn ON   ST   of ➔ The operation content is the same as above.
external START signal.

During auto run, STATUS   RUN   LED goes out and   STOP   lights.

When the auto run by 1-block is completed, STATUS   RUN   LED goes out and   STOP   lights.

6.2.4.
To stop program temporarily during execution

Stop the auto run temporarily during execution.

<u>When the program is stopped temporarily from the pendant.</u>

[STOP]   ➜ Stop the program temporarily during operation.

<u>When the program is stopped temporarily by external signal.</u>

Turn OFF   SP   of   ➜ The operation content is the same as above.
external STOP signal.

During TEMP. STOP, both LEDs of STATUS   RUN   and   STOP light.

6.2.5.
To restart program during TEMP. STOP

Restart the program stopped temporarily by STOP inputting mode.

<u>When the program is restarted from the pendant panel.</u>

[START]   ➜ Remained program that the program is stopped because of TEMP. STOP is operated automatically.
+ ENABLE switch

<u>When the program is restarted by the external signal.</u>

Turn ON   SP   of ➜ Release the STOP signal from the external equipment.
external STOP signal.

Turn ON   ST   of ➜ The operation content is the same as above.
external START signal.

During auto run, STATUS   RUN   LED lights.
When the auto run by 1-block is completed, STATUS   RUN   LED goes out and   STOP   lights.

6.2.6.
Program interruption

Interrupt the program during execution to stop the operation.

<u>When the program is interrupted from the panel.</u>

[RESET]   ➜ Stop the operation during auto run to reset it.

<u>When the program is interrupted by the external signal.</u>

Turn ON   RST   of ➜ The operation is stopped during automatic operation to reset the machine.
external RESET signal.

After resetting, STATUS   RESET   LED lights.
The block of program returns to a top line (N000).

6.3.   Manual run

The following explains the steps to operate the table manually by a MANUAL mode.

6.3.1.
Mode selection   Select the MANUAL mode to operate the table manually.

[MODE]   ➔ When pushing **MODE**, the mode is changed in order. Push this button several times until   MANUAL   is selected (LED lighting).

6.3.2.
Axis selection   In case of MAC mini iH2/iHT, the axis to be manually operated is selected.

[A/B]   ➔ **A/B** When pushing, A-axis and B-axis are changed.

The LED selecting the axis lights.

6.3.3.
Low speed JOG feed   A low speed JOG feed is actuated by a manual run.

[INS] +ENABLE switch   ➔ The table rotates in CW direction (Clockwise) with the button pushed.

[DEL] +ENABLE switch   ➔ The table rotates in CCW direction (Counterclockwise) with the button pushed.

STATUS   RUN   LED lights during feed.

Precautions   ➢ A low speed JOG federate is the set speed of PRM005.
However, since the set value of PRM003 (Rapid traverse) is determined as upper limit, the set value more than its value is restrained by the set value of PRM003.

➢ The machine can be manually operated only when the ENABLE switch is pushed.

6.3.4.
High speed JOG feed   A high speed JOG feed is actuated by a manual run.
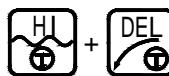
     HI   **INS**   ➔   With two keys still pushed simultaneously, the
                                     table rotates in CW (Clockwise).

   + ENABLE switch

     HI   **DEL**   ➔   With two keys still pushed simultaneously, the
                                     table rotates in CCW (Counterclockwise).

   + ENABLE switch

     STATUS   RUN   LED lights during feed.

     When releasing **HI** during high speed feed, the mode becomes the low
     speed JOG feed continuously. When pushing **HI** during a low speed
     feed, the mode becomes the high speed JOG feed.

Precautions   ➢   The high speed JOF feed the set speed of PRM004.

        However, since the set value of PRM003 (Rapid traverse) is determined as
        upper limit, the set value more than its value is restrained by the set value
        of PRM003.

     ➢   The machine can be manually operated only when the ENABLE switch
        is pushed.

6.3.5.
STEP feed   Shift the table every angle determined.

     INS   ➔   The table shifts by the set angle in   direction
                                     by keying in at one shot.

   + ENABLE switch

     DEL   ➔   The table shifts by the set angle in   direction
                                     by keying in at one shot.

   + ENABLE switch

     STATUS   RUN   LED lights during feed.

Precautions   ➢   The step feed amount is set to PRM006 and an initial set value is 0.001°.

     ➢   One shot time is 1 second or less.

        When pushing the button for 1 second or more, the mode becomes the low
        speed JOG feed.

     ➢   The machine can be manually operated only when the ENABLE switch
        is pushed.

6.4.   Override

The following explains the steps to apply the override for the speed of the auto run or manual feed.

6.4.1.
Override display

Display any override state for a command federate.

➔ The percent (%) for the command speed is displayed on the right side of screen.

The override display becomes effective when "AUTO" or "MANUAL" mode is selected.

6.4.2.
Override change

Increase or reduce the override.

➔ The override is added as often as **INS** is pushed.
When INCREASE is repeated, "MAX" is displayed and the mode becomes the rapid traverse.

➔ The override is reduced as often as **DEL** is pushed.
The minimum set value of override is "20%".

When the override is except 100% with "AUTO" or "MANUAL" mode selected, LED of each mode flickers.

Precautions

➢ The INCREASE or DECREASE every button pushing is set to PRM014 and the initial set value is 5%.
Even if the override is changed, since the set value of PRM003 (Rapid traverse) is determined as upper limit, the set value more than its value is restrained by the set value of PRM003.

6.5.   Manual pulse generator   Option

The manual pulse generator can be used by the MANUAL mode.

The following explains the operating steps of manual pulse generator.

6.5.1.
Conf. display of manual pulse generator

Display to check that the manual pulse generator selects the axis as is.

Selected to A-axis   ➔   LED on A-axis of **A/B** flickers.

Selected to B-axis   ➔   LED on B-axis of **A/B** flickers.

Axis set to OFF.   ➔   LED on A-axis or B-axis (selected side) of **A/B** lights.

6.5.2.
Shifted by manual pulse generator

Shift the axis with the manual pulse generator.

MODE   ➔   Push **MODE** and selects   MANUAL   .

Axis selection   ➔   Select the axis to be shifted with the manual pulse generator.

     In case of 1-axis spec., A-axis is selected.
     In case of 2-axis spec., A-axis or B-axis is selected.

Shift factor selection   ➔   Select the scale factor of feed with the manual pulse generator as follows:
When shifting at 0.001° unit, " × 1" is selected, at 0.01° unit, " × 10" is selected and at t 0.1° unit, " × 100" is selected.

Dial turned in CW   ➔   Selected axis is shifted in   direction according to the scale factor.

Dial turned in CCW.   ➔   Selected axis is shifted in   direction according to the scale factor.

Precautions

➢   A / B axes of 2-axis spec., are set by PRM117. The axis set as PRM117=1 is A-axis and the axis set as PRM117=2 is B-axis

➢   When operating the rotary table with the manual pulse generator, though the table may rotate in an improper motion, there is no problem.

7   Diagnostics

7.1.   Diagnostic screen structure   Operation

The diagnostic screen can check the situations such as the coordinate system, I/O, servo, etc.

**7.1.1.
Diagnostic screen
structure**

Thirteen screens are prepared as shown bellow:

Coordinate system

       Commanded Work Coordinate Display (WP-R)

       Commanded Machine Coordinate Display (MP-R)

       Work Coordinate Encoder Data Value Display   WP-E

       Machine Coordinate Encoder Data Value Display   MP-E

       Remained Shift Display (RD-R)

I/O system   Externally Connected INPUT State Display (AC-I)

       Table INPUT State Display (EA-I)

       Externally Connected OUTPUT State Display (AC-O)

       Table OUTPUT State Display (EA-O)

Servo system

       POS-DEV Display (P-DEV)

       Rotor Angle Display (ROTOR)

       MZRN Data Display (DA-ZP)

       Current % Display (CUR-LF)

**7.1.2.
Diagnostic screen
display**

The diagnostic screen is displayed in order.

➔ As often as **DGN** is pushed, the diagnostic screen is changed every page.

1-axis spec.

Channel No.   Command angle

CH00 A   0. 000
N000   WP-R

Block No.   Command work coordinate display

2-axis spec.

Channel No.   Command angle

CH00 A   0. 000
N000 B   123. 456 WP-R

Block No.   Command work coordinate display
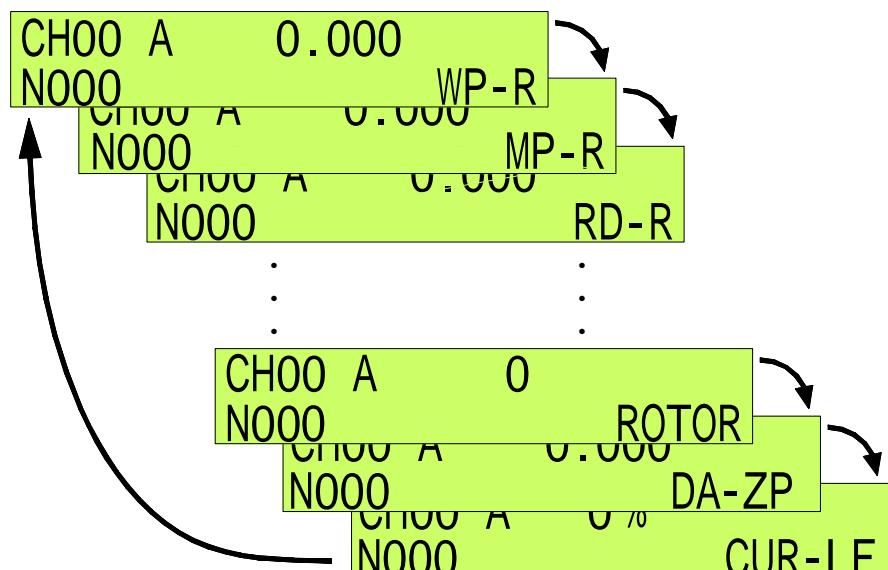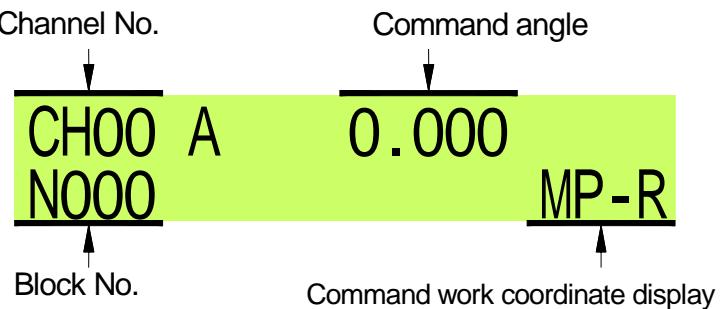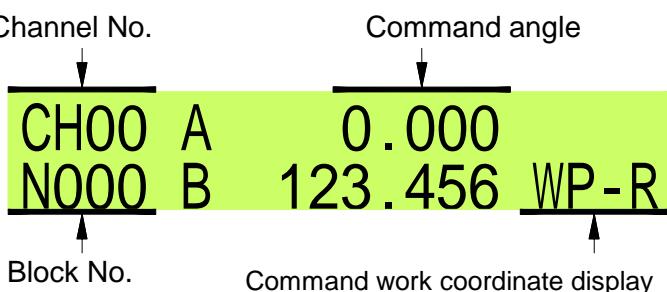
As shown the above, only A-axis is displayed at 1-axis spec.   MAC mini

iH / iHF   .   Both axes are displayed on a screen (A-axis on upper stage,

B-axis on lower stage) at 2-axis spec. (MAC mini iH2 / iHT series)

This display method is common to a general diagnosis screen.

7.1.3.
I/O diagnostic display
content confirmation

On the diagnostic screen of I/O system, the I/O condition is displayed with
" 1" ON " 0" OFF. The under bar located under 1" or " 0" shows the
signal content.

➔ Feeds the signal content to right. At this time,
" " under the signal condition display " 1"
" 0" is shifted in order.

When keying in at the right edge, the signal is
shifted to left.

➔ Feeds the signal content to left. At this time, " "
under the signal condition display " 1" " 0" is
shifted in order.

When keying in at the left edge, the signal is
shifted to right.

➔ The left top signal is selected.

7.2.   Command work coordinate display   WP-R

The angle commanded by the program is displayed on the coordinate system on the basis of WZRN position（0.000）.

**7.2.1.
Command work
coordinate screen**
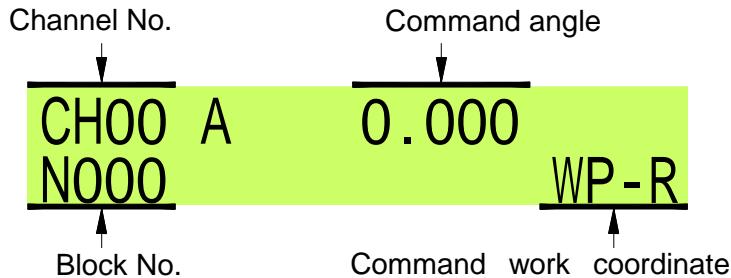
Channel No.   Command angle

CH00 A   0. 000
N000   WP-R

Block No.   Command work coordinate

In case of 2-axis spec., the content of A-axis is displayed on upper stage and that of B-axis on lower stage.

The block No. displayed becomes an execution block during operation and it becomes a next execution block during stop.

7.3.   Command machine coordinate display   MP-R

The angle commanded by the program is displayed on the coordinate system on the basis of WZRN position（0.000）.

**7.3.1.
Command machine
coordinate screen**
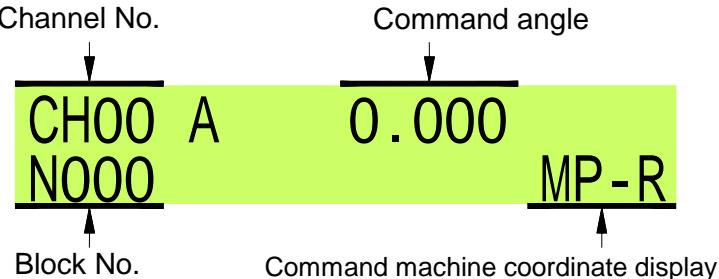
Channel No.   Command angle

CH00 A   0. 000
N000   MP-R

Block No.   Command machine coordinate display

In case of 2-axis spec., the content of A-axis is displayed on upper stage and that of B-axis on lower stage.

The block No. displayed becomes an execution block during operation and it becomes a next execution block during stop.

7.4.   Remained shift display   RD-R

Remained shift is displayed for the command position.

7.4.1.
Remained shift
screen

Channel No.   Remained shift

```
CH00 A        0.000
N000             RD-R
```

Block No.   Remained shift display

In case of 2-axis spec., the content of A-axis is displayed on upper stage and that of B-axis on lower stage.

The block No. displayed becomes an execution block during operation and it becomes a next execution block during stop.

7.5.　　External connection INPUT condition display　　AC-I

The INPUT signal condition of external connection　CB3i cable　is displayed with "1"
ON "0" OFF.

**7.5.1.
External connection
INPUT screen**

INPUT signal condition
"1":ON,"0":OFF

External select channel in binary input.

O1100011100 CH 07
ST   AC-I

Select signal name

External connection INPUT condition display
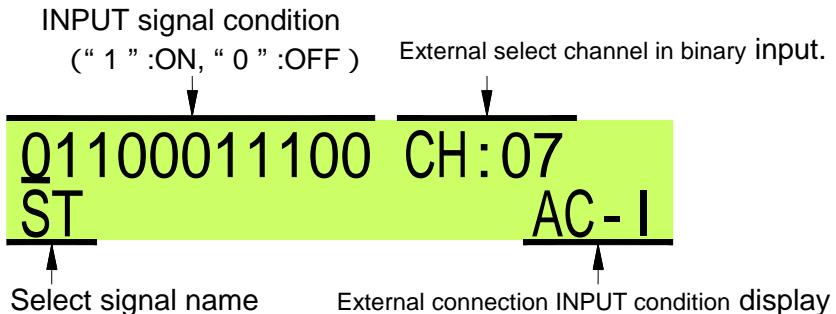
Detailed INPUT signal names

O1100011100 CH 07

$1\times2^0 +1\times2^1 +1\times2^2 +0\times2^3 =7$
External channel selection
(Binary type)
CHSET/ Channel set
CHSEL3/ Channel selection 3bit
CHSEL2/ Channel selection 2bit
CHSEL1/ Channel selection 1bit
CHSEL0/ Channel selection 0bit
MANUAL/ MANUAL mode
AUTO/ AUTO mode
RST/ RESET
*EXT EM/ External emergency stop
*SP/ STOP
ST/ START
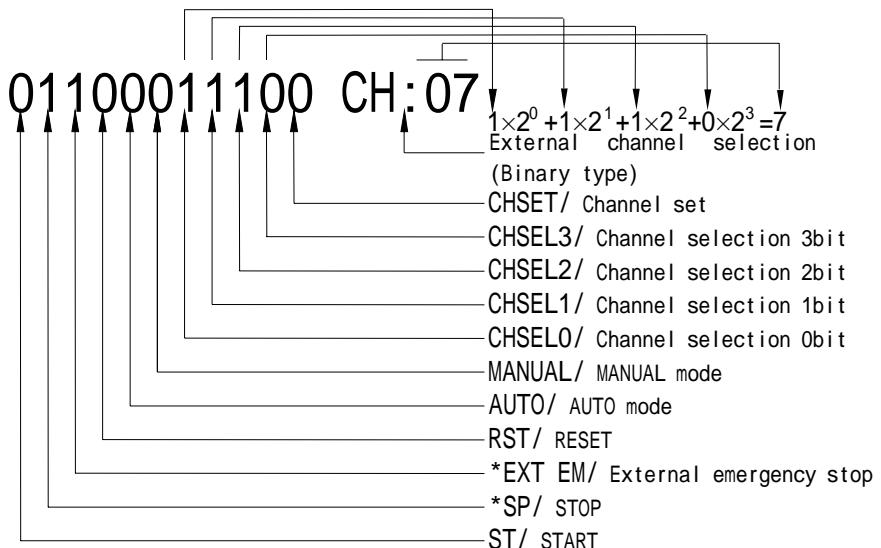
N+ and N- can select the INPUT signal and selected signal name is
displayed on the lower left.
Mark "　" of INPUT signal name shows B-contact.
Since the INPUT signal is used together for A and B axes, it is not
displayed every axis.

7.6.   Table INPUT condition display   EA-I

The INPUT signal condition of table is displayed with "1" ON "0" OFF.

7.6.1.
Table INPUT screen

1-axis spec.

Axis name

INPUT signal condition
"1" : ON "0" : OFF

Selected signal name

A 011000 CLAMP

EA-I

2-axis spec.

A 011000 CLAMP
B 011110 *OT1   EA-I

Table INPUT state display

ZRN/ External ZRN INPUT
*OT2/ Overtravel 2
*OT1/ Overtravel 1
*DEC/ NZRN signal
UNCLAMP/ Unclamp
CLAMP/ Clamp

An INPUT signal name can be displayed individually for A-axis and B-axis.
[N+] [N-] can select the INPUT signal name and the selected signal name is displayed on the right side of INPUT signal.
Mark " " of INPUT signal name shows B-contact.

7.7.   External connection OUTPUT condition display   AC-O

The OUTPUT signal condition of external connection (CB3i cable) is displayed with " 1"
ON " 0" OFF.

7.7.1.
External connection
OUTPUT screen

OUTPUT condition
" 1" :ON," 0" :OFF   Current selected channel

```
01111100000 CH 07
BLKFIN              AC-C
```

Selected   signal   External connection OUTPUT
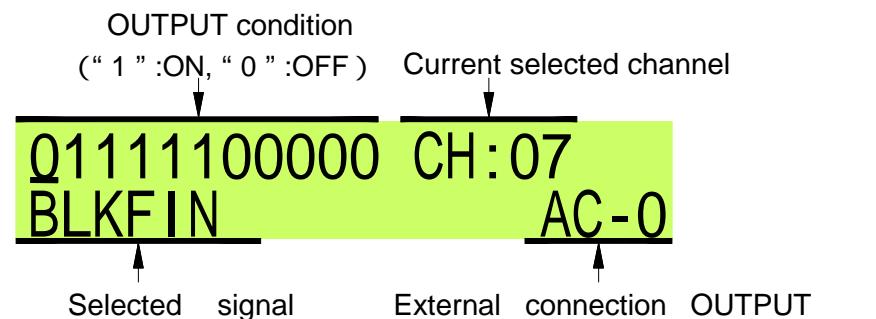
Detailed OUTPUT signal name

```
01111110000 CH 07
```

$1\times2^0 +1\times2^1 +1\times2^2 +0\times2^3$
$+0\times2^4 +0\times2^5 +0\times2^6 =7$
External channel selection (Binary)

CHOUT6/ Select channel 6bit
CHOUT5/ Select channel 5bit
CHOUT4/ Select channel 4bit
CHOUT3/ Select channel 3bit
CHOUT2/ Select channel 2bit
CHOUT1/ Select channel 1bit
CHOUT0/ Select channel 0bit
*EMOUT/ Emergency stop
ALMOUT/ Alarm
BLKFIN/1 BLKFIN
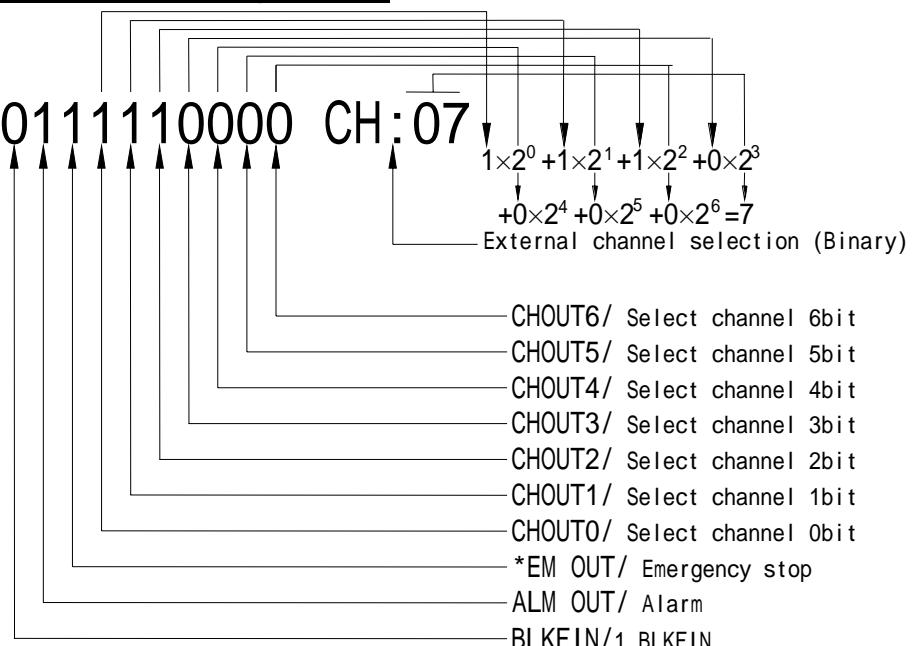
N+   N- can select OUTPUT signal name.

Mark "   " of   OUTPUT signal name shows B-contact.

Since OUTPUT signal of A-axis is used together with B-axis, its signal is
not displayed every axis.

7.8.   Table OUTPUT condition display   EA-O

The OUTPUT signal condition of table is displayed with "1" ON "0" OFF.

**7.8.1.
Table OUTPUT
screen**

-axis spec.

Axis name
"1" : ON, "0" : OFF   OUTPUT signal condition   Select signal name

A 01100 SERVO ON
                    EA-C

2-axis spec.

A 01100 SERVO ON
B 01101 ZRNFIN EA-C

Table OUTPUT condition display

ZRNFIN/Machine zero return finish
360FIN/Work zero position output
G99FIN/Optional block finish
BRAKE ON/ Brake ON
SERVO ON/ Live servo
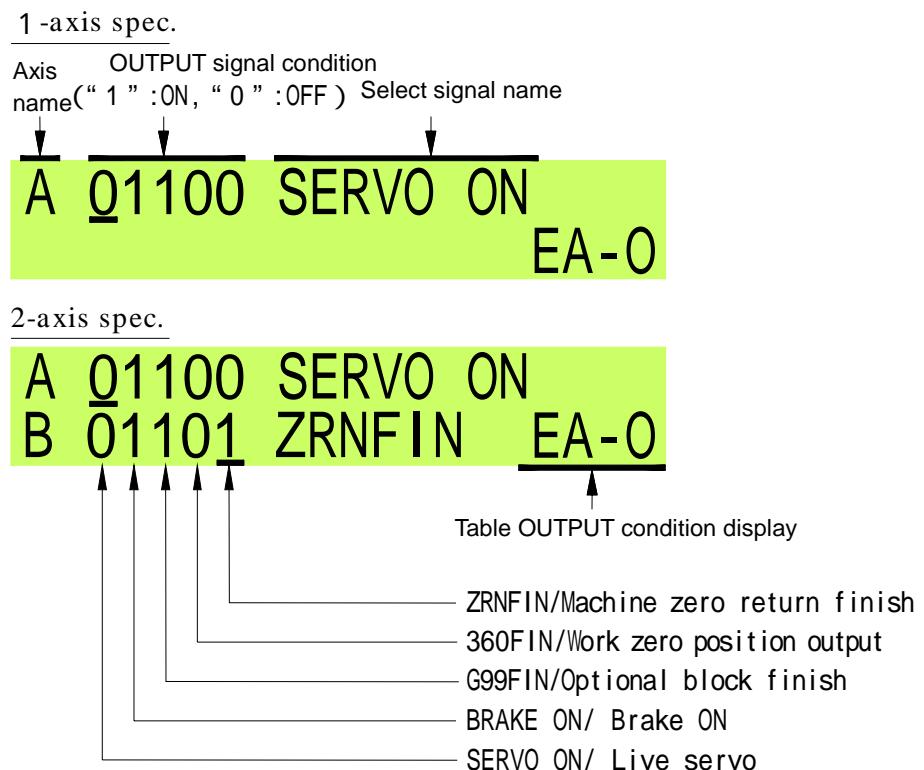
Each OUTPUT signal name for A-axis and B-axis can be displayed.

In the OUTPUT signal name, the axis selected with the axis change key can be selected with N+   N- .

7.9.   WCRNT encoder data display   WP-E

The coordinate system based on WZRN POS (0.000) displays the angle on the current encoder data. This data differs from a command and it is calculated from the motor data of current position.

**7.9.1.
Work coordinate
encoder data screen**
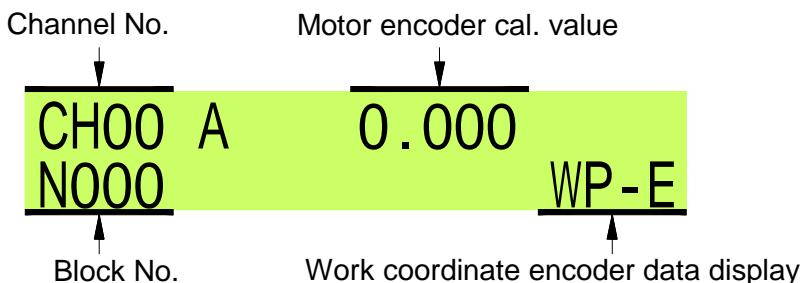
Channel No.   Motor encoder cal. value

CH00 A   0. 000
N000   WP-E

Block No.   Work coordinate encoder data display

In case of 2-axis spec., the content of A-axis is displayed on upper stage and that of B-axis on lower stage.

The block No. displayed becomes an execution block during operation and it becomes a next execution block during stop.

7.10.   Machine coordinate encoder data display   MP-E

The coordinate system based on MZRN POS (0.000) displays the angle on the current encoder data. This data differs from a command and it is calculated from the motor data of current position.

**7.10.1.
Machine coordinate
encoder data screen**
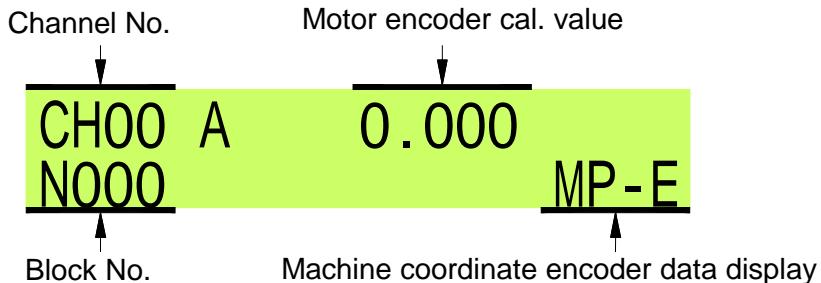
Channel No.   Motor encoder cal. value

CH00 A   0. 000
N000   MP-E

Block No.   Machine coordinate encoder data display

In case of 2-axis spec., the content of A-axis is displayed on upper stage and that of B-axis on lower stage.

The block No. displayed becomes an execution block during operation and it becomes a next execution block during stop.

7.11.　POS-DEV display　　P-DEV

This mode displays the difference of the program command and an actual shift position.

7.11.1.
POS-DEV screen
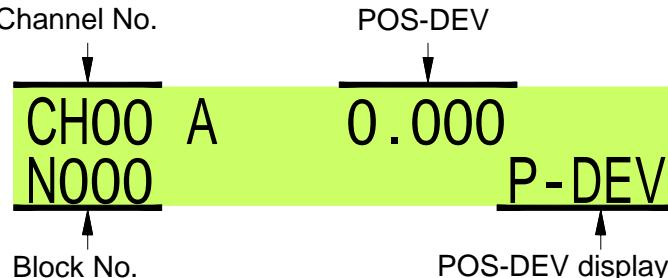
Channel No.　　　　　　　　　　POS-DEV

```
CH00 A        0.000
N000          P-DEV
```

Block No.　　　　　　　　POS-DEV display

> In case of 2-axis spec., the content of A-axis is displayed on upper stage and that of B-axis on lower stage.
>
> The block No. displayed becomes an execution block during operation and it becomes a next execution block during stop.
>
> When POS-DEV shows " ", it means that feed is insufficient. When " ", it means that the feed is passed.

7.12.　Rotor angle display　　ROTOR

This mode displays that any rotor angle is detected from the basic pulse of motor encoder.

7.12.1.
Rotor angle screen
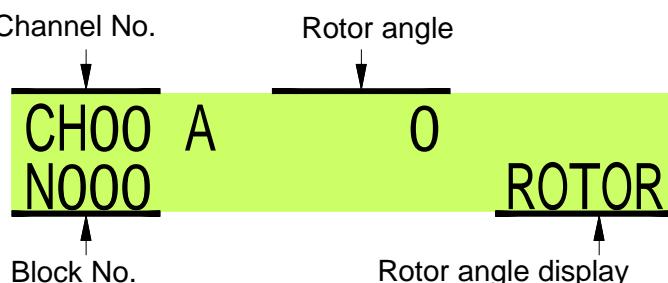
Channel No.　　　　　　　Rotor angle

```
CH00 A          0
N000          ROTOR
```

Block No.　　　　　　Rotor angle display

> In case of 2-axis spec., the content of A-axis is displayed on upper stage and that of B-axis on lower stage.
>
> The block No. displayed becomes an execution block during operation and it becomes a next execution block during stop.

7.13. MZRN data display   DA-ZP

This mode displays the angle from the deceleration dog detection in MZRN to basic pulse of motor encoder.

This displayed-value is updated as often as MZRN is repeated.

7.13.1.
MZRN data screen
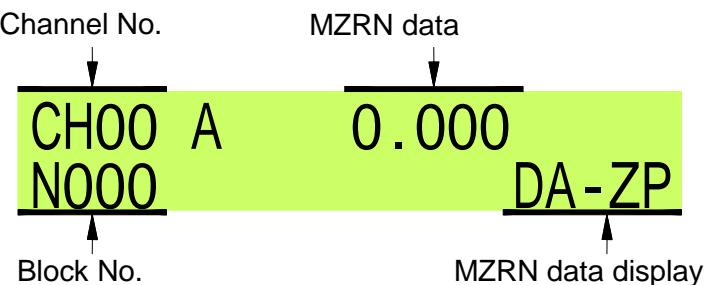
Channel No.　　　　　MZRN data

```
CH00 A      0.000
N000          DA-ZP
```

Block No.　　　　　　　MZRN data display

In case of 2-axis spec., the content of A-axis is displayed on upper stage and that of B-axis on lower stage.

The block No. displayed becomes an execution block during operation and it becomes a next execution block during stop.

7.14. Current % display   CUR-LF

This mode displays the current load condition at % for motor rated current value.

7.14.1.
Current % screen
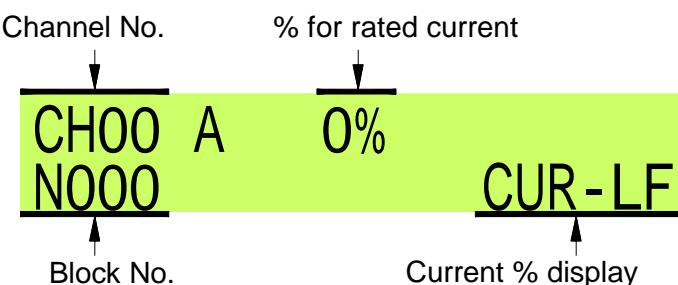
Channel No.　　　　　% for rated current

```
CH00 A      C%
N000          CUR-LF
```

Block No.　　　　　　　Current % display

In case of 2-axis spec., the content of A-axis is displayed on upper stage and that of B-axis on lower stage.

8   Program Examples

8.1.   Unequal partition
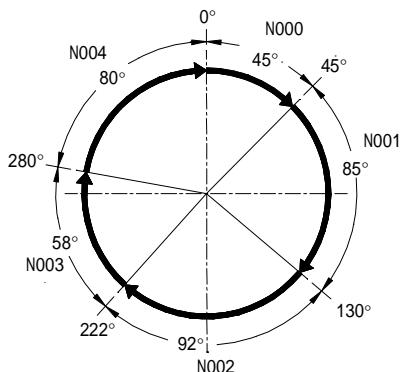
Incremental

N000	G91 A45.000 F0	Incremental command 45° rev. at rapid traverse
N001	A85.000	85° rev. at rapid traverse
N002	A92.000	92° rev. at rapid traverse
N003	A58.000	58° rev. at rapid traverse
N004	A80.000 J0	80° rev. at rapid traverse To top program of N000

Absolute

N000	G90 A45.000 F0	Absolute command Rev. to 45° pos at R/trvs.
N001	A130.000	Rev. to 130° pos at R/trvs.
N002	A222.000	Rev. to 222° pos at R/trvs.
N003	A280.000	Rev. to 280° pos at R/trvs.
N004	A0.000 J0	Rev. to 0° pos at R/trvs. To top program of N000

8.2.   Equipartition
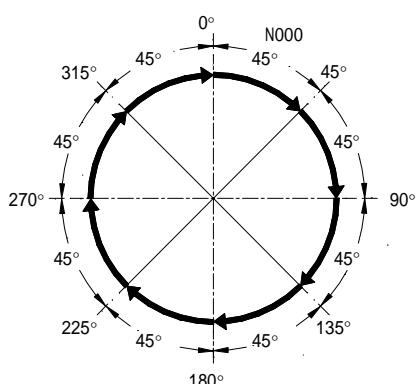
Block repeating

N000	G91 A45.000 F0 J0	Incremental command 45° rev. at rapid traverse To top program of N000

This program is repeated 8 times.

Partition command

N000	G91 A360.000 F0 D8 J0	
		Rev. to 360° /8 at R/trvs. To top program of N000

For revolution of 360° /8 45° , the ST signal is required every

cycle. After operating 8 times, the program is finished.

8.3. Loop jumping functions
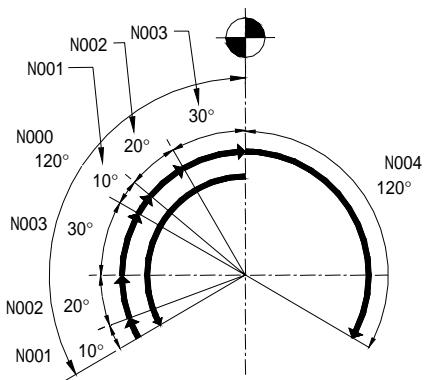
N000	G91 A-120.000 F0	Incremental command -120° rev. at R/trvs.
N001	A10.000	10° rev. at R/trvs.
N002	A20.000	20° rev. at R/trvs.
N003	G25 A30.000 J1	Escaped from loop after revolving 30° at rapid traverse when passed through WZERO position or stopped at its place. When not passed or stopped, the block jumps to N001 and loop is repeated.
N004	G90 A120.000 J0	Absolute command Revolved to 120° position at rapid traverse. To program top of N000

8.4. Repeating functions
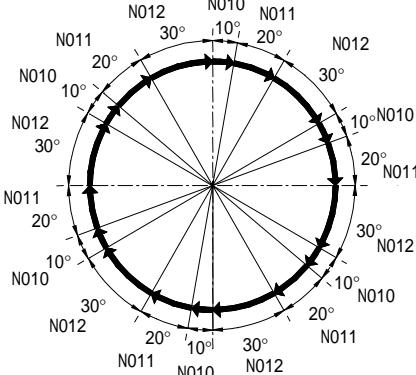
N000	G27 P010 E012 L6 J0	Repeating command N010 N012 are repeated 6 times. To program top of N000
N010	G91 A10.000 F0	Incremental command 10° rev. at R/trvs.
N011	A20.000	20° rev. at R/trvs.
N012	A30.000	30° rev. at R/trvs.

8.5. Subprograms
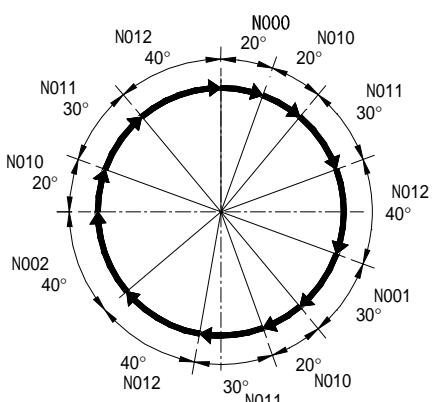
N000	G91 A20.000 F0 J10	Incremental command 20° rev. at rapid traverse. Subprogram jumps to N010.
N001	A30.000 J10	30° rev. at rapid traverse. Subprogram jumps to N010.
N002	A40.000 J10	40° rev. at rapid traverse. Subprogram jumps to N010.
N010	A20.000	20° rev. at rapid traverse.
N011	A30.000	30° rev. at rapid traverse.
N012	A40.000 J-1	40° rev. at rapid traverse. Because of subprogram end, returned to original place before jumping.

PARAMETER·EXPANSION MANUAL

■   Readers for This Manual

Readers for this manual are as follows:

➢   Persons who make trial run or servo adjustment

➢   Persons who adjust parameters

➢   Persons who control inside data

Contents

1.   Parameter

1.1.   Parameter setting

The parameter setting mode differs by the methods combining with the circular table. Therefore, this mode is used for setting the data corresponding to the circular table and for using the various control functions in several ways.

1.1.1.
Setting preparation

Each parameter can be set only by PARAM (parameter) mode regardless of STATUS such as alarms, etc.

To prevent the mis-input of parameter, the parameter cannot be inputted unless a SET PERMISSION code is inputted.

When inputting the parameter, input the SET PERMISSION code into PRM110.

The content of PRM110 becomes the write inhibit state (PRM110=0) of an initial value when the mode is changed or power is turned OFF.

      SET PERMISSION code

0	STD Value	All parameters cannot be set.
1		Parameters of PRM001 499 can be changed.
999		All parameters of PRM001 633 can be changed.

1.1.2.
Setting steps

`MODE`	Push until PARAM is selected.
`ENT`	Make PRM110 in setting state.
`1` or `9` `9` `9`	Input a settable code.
`ENT`	Set a SET PERMISSION code.

```
A: 110            1
PRM INPUT PURMISSION
```
　　　　　　　　PRM INPUT permission

Above is the steps for PRM INPUT PERMISSION and the PARAM LED of
MODE flickers.

In case of 2-axis spec., push `A/B` and select the axis that sets the
parameter before inputting the following data.

`N` [PRM No.] `ENT`	Specify the parameter set.
`ENT` [Set value] `ENT`	Change to set value.

Similarly, change the parameter required for change.

`INPUT`	Parameter setting register

```
A: 003      33.33
RAPID TRAVERSE
```
　　　　　　　　Parameter setting

- As the parameter selection method of　, the parameter can also be
  selected one by one with `N+` Next selection , `N-` Former
  selection .

- When inputting the set value of　, the current set value flickers by
  pushing `ENT` first. When pushing `ENT` after inputting the set
  value, a newly set value lights.

Precautions

> 1. When `INPUT` is not pushed after changing the parameter, the final
>   parameter is not set.
>
>   When the mode is changed and power is turned OFF without pushing
>   `INPUT` , the parameter set value returns to the value before changing.

1.2.   Parameter list

> Mark   in remarks' column shows that a set value cannot be changed.

> For mark   in remarks' column, it is necessary to turn OFF power in order to make a changed parameter valid.

> In MAC mini iH2/iHT, when a standard set value differs per axis, the values of A-axis/B-axis are entered to the standard set values. In case of MAC mini iH/iHF (1-axis spec.), A-axis is set.

> The parameter that the parameter column is masked shows that it is common parameter in case of 2-axis spec.

No.	Name	STD Set-value		Set unit	Set range	Remarks
	Displayed Message	A-axis	B-axis			
000	ROM Version					
	ROM VER					
002	MZRN DECEL. Speed	0.70		min^{-1}	0.00 1.00	
	MZRN LOW FEED					
003	Rapid Traverse Max. rotation speed	41.66	16.66	min^{-1}	0.00 99.99	Note1
	RAPID TRAVERSE					
004	JOG HI Speed	41.66	16.66	min^{-1}	0.00 99.99	Note1
	HI JOG FEED					
005	JOG HI Speed	1.00		min^{-1}	0.00 99.99	
	LO JOG FEED					
006	Step Feed Amount	0.001		deg	0.000 10.000	
	STEP FEED AMOUNT					
007	MZRN Shift Amount	0.000		deg	-360.000 360.000	
	MZRN SHIFT AMOUNT					
008	MZRN Feed	41.66		min^{-1}	0.00 99.99	Note1
	MZRN FEED					
009	Position Deviation Check Setting Time	0.30		SEC	0.00 1.00	
	POS-DEV CHECK TIMER					
010	Position Deviation Check Setting _Amount	0.100		deg	0.000 16.000	
	POS-DEV CHECK AMOUNT					
011	Gear Ratio 1/X	72	180		0,36,45 999	Note1
	GEAR RATIO 1/X					
013	Motor Rev. direction Flag	0			0,1	Note1
	MOTOR DIRECTION					
014	Override Step Amount	5		%	0 100	
	MOTOR DIRECTION					
015	Deviation Check Amount in Clamp	0.020		deg	0.000 16.000	
	POS-DEV CHECK CLAMP					
016	MZRN Direction	0			0,1	
	MZRN DIRECTION					
017	MZRN WZRN in Short Cut Direction	0	1		0,1,2	
	ZRN SHORT CUT DIR					
018	Optional Angle Assignment in Short Cut Return Direction	0.000		deg	0.000 359.999	
	ZRN DIR OPT POS					
020	BLKFIN Output Flag in G08, G09	0			0,1	
	BLKFIN FLAG (G08)					

No.	Name / Displayed Message	STD Set-value A-axis	STD Set-value B-axis	Set Unit	Set Range	Remarks
021	BLKFIN Output Flag in G07 / BLKFIN FLAG (G07)	0			0,1	
022	Object Signal of BLKFIN OUTPUT / BLKFIN TRIGGER	0			0,1	
023	Alarm Scan Cycle of Unclamp Signal / ALARM SCAN UNCLUMP	0.00		SEC	0.00 10.00	
024	Alarm Scan Cycle of Clamp Signal / ALARM SCAN CLAMP	0.00		SEC	0.00 10.00	
025	360FIN Output Spec. / 360FIN OUTPUT SPEC	0			0,1	
026	360FIN Output Area. / 360FIN OUTPUT AREA	0.000		deg	0.000 1.000	PRM25=1
027	360FIN OUTPUT SPEC / G99FIN OPR SPEC	0			0,1,2	
028	G99FIN Check Timer / G99FIN CHECK TIMER	0.00		SEC	0.00 9.99	
029	External ZRN Input Spec. / EXT ZRN SPEC	0			0,1,2	
030	SP Signal Function Spec. / SP/EXT SP FUNC SPEC	0			0,1	
031	External MZRN Function / MZRN BY THE EXT ST	0			0,1,2,3	
032	Clamp Spec. / CLAMP SPEC	0			0,1	
033	External Channel Spec. / EXT CH SPEC	0			0,1	
034	360FIN Output Contact Flag / 360FIN CONTACT FLAG	1			0,1	
035	BLKFIN Timer / BLKFIN TIMER	0.50		SEC	0.00 1.00	
036	360FIN Timer / 360FIN TIMER	0.50		SEC	0.00 1.00	
037	Timer from Unclamp to Rev. Start / ST TIMER FROM UCL	0.00		SEC	0.00 1.00	
038	Clamp Signal Flag / CLAMP SIGNAL FLAG	0			0,1	Note1
039	Clamp Output Contact Flag / BRAKE CONTACT FLAG	0			0,1	
040	Rev. Direction in Continuous Start (G22) / REV DIR (G22)	0			0,1	
041	Rev. Feed in Continuous Start G22 / REV FEED (G22)	5.00		min^{-1}	0.00 99.99	
042	BLK/G99 FIN Output Start Delay Flag G21 / BLK/G99 DELAY (G21)	0			0,1	
043	BLK/G99 FIN Output Start Delay Timer G21 / BLK/G99 DELAY TIMER	0.00		SEC	0.00 1.00	
044	Servo Control Flag / SERVO CONTROL FLAG	0			0,1	Note1

No.	Name / Displayed Message	STD Set-value A-axis	STD Set-value B-axis	Set Unit	Set Range	Remarks
046	Panel ST Key Input Flag in AUTO Mode / ST KEY IN AUTO	0			0,1	
047	WZERO Position Setting every Channel ☞ Each channel setting PRM300 PRM389 / SETUP WZERO POS	0			0,1	
100	Software Limit Specification / S/W LIMIT SPEC	0			0 1 2	
101	Software Limit MIN / S/W LIMIT OF MIN	0.000		deg	0.000 359.999	
103	Software Limit MAX / S/W LIMIT OF MAX	0.000		deg	0.000 359.999	
105	Unidirectional Positioning Spec. / UNIDIRECTIONAL SPEC	0	1		0 1 2	
106	Unidirectional Positioning Approach Amount / UNIDIRECTIONAL ANGLE	0.000	1.000	deg	0.000 359.999	
110	Parameter INPUT Permission Flag / PRM INPUT PERMISSION	0			0 1 999	
112	Channel Select Flag / CH SELECT FLAG	0			0 1	
117	Axis Type / AXIS TYPE	iH / iHF : 0	iH2 / iHT : 1		0 1	
121	Over Travel Detecting Type / OT ADMIN TYPE	0			0 1	
122	MZERO Position Setting Method / ORG MODE SELECT	0			0 1 2	
123	MZERO Position Establishing Flag / ORG POS COMPLETE	1			0 1	
200	Zero Pulse Mask Amount / Z-PULSE MASK AMOUNT	0.000		deg	0.000 9.999	
203	Backlash Compensation Amount / BACKLASH COMP AMOUNT	0.010			0.000 1.000	
206	OV RUN Contact Type / OV RUN CONTACT TYPE	0	1		0 1	
208	Pitch Error Com.01 000° 015° / PITCH ERROR 01	0.000		deg	-32.766 +32.766	
209	Pitch Error Com.02 015° 030° / PITCH ERROR 02	0.000		deg	-32.766 +32.766	
210	Pitch Error Com.03 030° 045° / PITCH ERROR 03	0.000		deg	-32.766 +32.766	
211	Pitch Error Com.04 045° 060° / PITCH ERROR 04	0.000		deg	-32.766 +32.766	
212	Pitch Error Com.05 060° 075° / PITCH ERROR 05	0.000		deg	-32.766 +32.766	
213	Pitch Error Com. 06 075° 090° / PITCH ERROR 06	0.000		deg	-32.766 +32.766	
214	Pitch Error Com. 07 090° 105° / PITCH ERROR 07	0.000		deg	-32.766 +32.766	

No.	Name / Displayed Message	STD Set-value A-axis	STD Set-value B-axis	Set Unit	Set Range	Remarks
215	Pitch Error Com. 08 105° 120° PITCH ERROR 08	0.000		deg	-32.766 +32.766	
216	Pitch Error Com. 09 120° 135° PITCH ERROR 09	0.000		deg	-32.766 +32.766	
217	Pitch Error Com. 10 135° 150° PITCH ERROR 10	0.000		deg	-32.766 +32.766	
216	Pitch Error Com. 09 120° 135° PITCH ERROR 09	0.000		deg	-32.766 +32.766	
217	Pitch Error Com. 10 135° 150° PITCH ERROR 10	0.000		deg	-32.766 +32.766	
218	Pitch Error Com. 11 150° 165° PITCH ERROR 11	0.000		deg	-32.766 +32.766	
219	Pitch Error Com. 12 165° 180° PITCH ERROR 12	0.000		deg	-32.766 +32.766	
220	Pitch Error Com. 13 180° 195° PITCH ERROR 13	0.000		deg	-32.766 +32.766	
221	Pitch Error Com. 14 195° 210° PITCH ERROR 14	0.000		deg	-32.766 +32.766	
222	Pitch Error Com. 15 210° 225° PITCH ERROR 15	0.000		deg	-32.766 +32.766	
223	Pitch Error Com. 16 225° 240° PITCH ERROR 16	0.000		deg	-32.766 +32.766	
224	Pitch Error Com. 17 240° 255° PITCH ERROR 17	0.000		deg	-32.766 +32.766	
225	Pitch Error Com. 18 255° 270° PITCH ERROR 18	0.000		deg	-32.766 +32.766	
226	Pitch Error Com. 19 270° 285° PITCH ERROR 19	0.000		deg	-32.766 +32.766	
227	Pitch Error Com. 20 285° 300° PITCH ERROR 20	0.000		deg	-32.766 +32.766	
228	Pitch Error Com. 21 300° 315° PITCH ERROR 21	0.000		deg	-32.766 +32.766	
229	Pitch Error Com. 22 315° 330° PITCH ERROR 22	0.000		deg	-32.766 +32.766	
230	Pitch Error Com. 23 330° 345° PITCH ERROR 23	0.000		deg	-32.766 +32.766	
231	Pitch Error Com. 24 345° 360° PITCH ERROR 24	0.000		deg	-32.766 +32.766	
240	RS232C Communication Speed RS232C BAUD RATE	2			0 1 2 3	
242	RS232C Data Length RS232C DATA HEAD	0			0 1	
243	RS232C Parity Bit RS232C PARITY BIT	0			0 1 2	
244	RS232C Stop Bit RS232C STOP BIT	0			0 1	
245	Servo Parameter Check Function in Power ON SERVO PRM CHECK FUNC	0			0 1 2	

No.	Name	STD Set-value		Set Unit	Set Range	Remarks
	Displayed Message	A-axis	B-axis			
250	Imposition Width	10		0.001deg	0　32767	
	IMPOSITION WIDTH					
251	Constant 1 in Acceleration/Deceleration	150		msec	0　1000	
	ACC/DEC CONSTANT 1					
252	Constant 1 in Acceleration/Deceleration	1		msec		
	ACC/DEC CONSTANT 2					
253	Enable Switch Flag	0			0　1	
	ENABLE SW FLAG					
255	MZRN Dead Slow Speed Percent	0		%	0　100	
	MZRN 2TH FL RATE					
256	360° FIN Chattering Prevention Timer	0.0		SEC	0.0　1.0	
	360FIN CHATTERING					
257	MZRN Mode	15		SEC		
	HMODE					
258	MZRN Time-out	100		SEC		
	MZRN TIME-OUT					
300	WZERO Position Every Channel　CH00	0.000		deg	0.000　359.999	
	WZERO POSITION CH00					
389	WZERO Position Every Channel　CH89	0.000		deg	0.000　359.999	
	WZERO POSITION CH89					
390	Channel/Block Structure Spec.	0			0　1　2	
	CH/BLOCK CHECKIG SPEC					
400	Number of Blocks every Channel　CH00	0		BLOCK	0　1000	
	BLOCKS OF CH00					
489	Number of Blocks every Channel　CH89	0		BLOCK	0　1000	
	BLOCKS OF CH89					

Servo parameter

- ➢ Mark in remarks' column shows that a set value cannot be changed.

- ➢ For mark in remarks' column, it is necessary to turn OFF power in order to make a changed parameter valid.

- ➢ AUTO in remarks' column shows that the value is automatically set by other parameter. The set value cannot be directly changed on the parameter item of AUTO.

- ➢ The same standard set value of servo parameter is set to both A-axis/B-axis.

No.	Name / Displayed Message	STD Set-value	Set Unit	Set Range	Remarks
500	Function Select Basic Switch 0 / P000 BASIC SW0	0011	hex		AUTO
501	Function Select Basic Switch 1 / P001 APPLICATION SW1	0000	hex		
502	Function Select Basic Switch 2 / P002 APPLICATION SW2	0000	hex		
506	Function Select Basic Switch 6 / P006 APPLICATION SW6	0002			
507	Function Select Basic Switch 7 / P007 APPLICATION SW7	0002			
508	Function Select Basic Switch 8 / P008 APPLICATION SW8	0000			
510	Speed Loop Gain / P100 SPEED LOOP GAIN	400	0.1Hz	10 2000	
511	Speed Loop Integration Time Constant / P101 SLG INTEGRATION	2000	0.01msec	15 51200	
512	Position Loop Gain / P102 POS LOOP GAIN	400	0.1/sec	10 2000	
513	Moment Ratio of Inertial / P103 INERTIA RATIO	350	%	0 20000	Note1
514	2nd Speed Loop Gain / P104 2TH S-LOOP GAIN	400	0.1/sec	10 2000	
515	Constant in 2nd Speed Loop Integration / P105 2TH SLG INTE	2000	0.01msec	15 51200	
516	2nd Position Loop Gain / P106 2TH POS L-GAIN	400	0.1/sec	10 2000	
517	Bias / P107 BIAS	0	min	0 450	
518	Bias Adding Width / P108 BIAS ADD WIDTH	7	POS COM	0 250	
519	Feed Forward / P109 FEED-FORWARD	0	%	0 100	
520	Constant in Feed Forward Filter / P10A F-F FILTER	0	0.01msec	0 6400	
521	Gain Application Switch / P10B GAIN APP SW	0000	hex		
522	Mode Switch (Torque Command) / P10C MODE-SW(TORQUE)	200	%	0 800	
523	Mode Switch (Speed Command) / P10D MODE-SW(SPEED)	0	min^{-1}	0 10000	

No.	Name / Displayed Message	STD Set-value	Set Unit	Set Range	Remarks
524	Mode Switch (Acceleration) / P10E MODE-SW(ACC)	0	10min^{-1}	0 3000	
525	Mode Switch (Deviation Pulse) / P10F MODE-SW(DEV)	0	POS COM	0 10000	
526	Auto Tuning Switch / P110 AUTO TUNING SW	0012	hex		
527	Speed Feedback Compensation / P111 SPEED-FEEDBACK	100	%	1 500	
528	Command Filter Gain / P119 CMD FILTER GAIN	500	0.1/sec	10 20000	
529	Command Filter Gain Compensation / P11A F-GAIN COMP	1000	0.1	500 2000	
530	Command Filter Bias (CW) / P11E CMD F-BIAS(CW)	100	0.1	0 10000	
531	Position Integration Time Constant / P11F POS INTEGRATION	0	0.1msec	0 50000	
532	3rd Speed Loop Gain / P12B 3TH S-LOOP GAIN	400	0.1/sec	10 20000	
533	3rd Loop Integration Time Constant / P12C 3TH SLG INTE	2000	0.1Hz	15 51200	
534	3rd Position Loop Gain / P12D 3TH POS L-GAIN	400	0.1msec	10 20000	
535	4th Speed Loop Gain / P12E 4TH S-LOOP GAIN	400	0.1/sec	10 20000	
536	4th Loop Integration Time Constant / P12F 4TH SLG INTE	2000	0.1Hz	15 51200	
537	4th Position Loop Gain / P130 4TH POS L-GAIN	400	0.1msec	10 20000	
538	Gain Change Time 1 / P131 GAIN CHANGE T1	0	1msec	0 65535	
539	Gain Change Time 2 / P132 GAIN CHANGE T2	0	1msec	0 65535	
540	Gain Change Wait Time 1 / P135 GAIN WAIT T1	0	1msec	0 65535	
541	Gain Change Wait Time 2 / P136 GAIN WAIT T2	0	1msec	0 65535	
542	Auto Gain Change Switch 1 / P139 AUTO GAIN FUNC1	0	hex		
543	Command Filter Bias (CCW) / P144 CMD F-BIAS(CCW)	1000	0.1	0 10000	
544	Prediction Control Select Switch / P150 PREDICTION CTL	0	hex		
545	Prediction Control Select Switch / P151 PREDICTION GAIN	100		0 300	
546	Prediction Control Dignity Ratio / P152 DIGNITY RATIO	100		0 300	
547	Servo Rigidity / P1A0 SERVO RIGIDITY	60		0 500	
548	Servo Rigidity 2 / P1A1 SERVO RIGIDITY2	60		0 500	
549	Speed Feedback Filter Time Constant / P1A2 SPEED F/B FLT	30	0.01msec	30 3200	

No.	Name / Displayed Message	STD Set-value	Set Unit	Set Range	Remarks
550	Speed Feedback Filter Time Constant 2 / P1A3 SPEED F/B FLT2	30	0.01msec	30 3200	
551	Torque Command Filter Time Constant 2 / P1A4 TQ FILTER2	10	0.01msec	0 2500	
552	Control Assistance Switch / P1A7 CTL ASSISTANCE	0	hex		
553	Auxiliary Integration Gain / P1A9 AUX INTE GAIN	60	Hz	0 500	
554	Position Ratio Gain / P1AA POS RATIO GAIN	60	Hz	0 500	
555	Feed Integration Gain / P1AB FEED INTE GAIN	60	Hz	0 500	
556	Feed Ratio Gain / P1AC FEED RATIO GAIN	380	Hz	0 2000	
560	Position Control Type Select Switch / P200 POS-CTL SELECT	256	hex		
561	Multi-turn Limit Setting / P205 MULCH TURN LMT	71	rev	0 65535	AUTO
562	Position Control Function Switch / P207 POS-CTL FUNC SW	0	hex		
563	Position Command ACC/DECL Bias / P209 POS REF BIAS	0	1-COM unit/sec	0 65535	
564	Electric Gear Ratio (Numerator) / P20E ELE-GEAR(NUM)	184320		1 $1073741824(2^{30})$	AUTO
565	Electric Gear Ratio (Denominator) / P210 ELE-GEAR(DEN)	5625		1 $1073741824(2^{30})$	AUTO
566	PG Dividing Ratio / P212 PG DIVID	1000	pulse/rev	16 $1073741824(2^{30})$	AUTO
567	Backlash Compensation Amount / P214 BACKLASH	0	COM UNIT	-32767 32767	
568	Backlash Compensation Time Constant / P215 BACKLASH TC	0	0.01msec	0 65535	
569	Position Command ACC/DEC Time Constant / P216 POS-REF A/D	0	0.1msec	0 65535	
570	Pos Command Moving Average Time / P217 P-REF MOVE TIME	0	0.01msec	0 10000	
571	Speed Command Input Gain / P300 SPEED REF GAIN	600	0.01V/ RTD SP	150 3000	
572	Internal Setting Speed 1 / P301 INT SET SPEED1	100	min^{-1}	0 10000	
573	Internal Setting Speed 2 / P302 INT SET SPEED2	200	min^{-1}	0 10000	
574	Internal Setting Speed 3 / P303 INT SET SPEED3	300	min^{-1}	0 10000	
575	JOG Feed / P304 JOG FEED	500	min^{-1}	0 10000	
576	Soft Start Acceleration Time / P305 SOFT ACC TIME	0	msec	0 10000	
577	Soft Start Deceleration Time / P306 SOFT DEC TIME	0	msec	0 10000	

No.	Name	STD Set-value	Set Unit	Set Range	Remarks
	Displayed Message				
578	Speed Command Filter Time Constant	40	0.01msec	0 65535	
	P307 SPEED REF FLT				
579	Speed F/B Filter Time Constant	0	0.01msec	0 65535	
	P308 SPEED F/B FLT				
580	Vibration Detecting Switch	0			
	P310 VIBRATION SW				
581	Vibration Detecting Sensitivity	100		50 500	
	P311 VIBRATION SENS				
582	Vibration Detecting Level	50	min^{-1}	0 5000	
	P312 VIBRATION LEVEL				
583	Torque Command Input Gain	30	0.1V/ RTD TRQ	10 100	
	P400 TORQUE REF GAIN				
584	Torque Command Filter Time Constant	100	0.01msec	0 65535	
	P401 TORQUE REF FLT				
585	Clockwise Torque Limitation	800	%	0 800	
	P402 CW TORQUE LMT				
586	Reverse Torque Limit	800	%	0 800	
	P403 CCW TORQUE LMT				
587	External Torque Limit on CW Side	100	%	0 800	
	P404 CW EXT T-LMT				
588	External Torque Limit on CCW Side	100	%	0 800	
	P405 CCW EXT T-LMT				
589	Emergency Stop Torque	800	%	0 800	
	P406 EM SP TORQUE				
590	Speed Limit in Torque Control	10000	min^{-1}	0 10000	
	P407 TORQUE-CL S-LMT				
591	Torque Function Switch	0000	hex		
	P408 TORQUE FUNC SW				
592	1st Stage Notch Filter Frequency	2000	Hz	50 2000	
	P409 1TH NOTCH FLT				
593	1st Stage Notch Filter Q-value	70	0.01	50 1000	
	P40A 1TH NOTCH FLT Q				
594	2nd Stage Notch Filter Frequency	2000	Hz	50 2000	
	P40C 2TH NOTCH FLT				
595	2nd Notch Filter Q-value	70	0.01	50 1000	
	P40D 2TH NOTCH FLT Q				
596	2nd Stage Secondary Torque Command Filter Frequency	2000	Hz	50 2000	
	P40F 2TH TQ FLT				
597	2nd Stage Secondary Torque Command Filter Q-value	70	0.01	70 1000	
	P410 2TH TQ FLT Q				
598	3rd Torque Command Filter Time Constant	2000	Hz	50 2000	
	P411 3TH TQ FLT				
599	1st Stage Secondary Torque Command Filter Time Constant	100	0.01msec	0 65535	
	P412 1TH 2-TQ FLT				
600	1st Stage Tertiary Torque Command Filter Time Constant	100	0.01msec	0 65535	
	P413 1TH 3-TQ FLT				

No.	Name / Displayed Message	STD Set-value	Set Unit	Set Range	Remarks
601	1st Stage Quartic Torque Command Filter Time Constant / P414 1TH 4-TQ FLT	100	0.01msec	0 65535	
602	Vibration Suppression Damping Ratio in Stop / P420 V-CTL RATIO	100		10 100	
603	Vibration Suppression Start Ratio in Stop / P421 V-CTL START	1000	msec	0 65535	
604	Gravity Compensation Torque / P422 GRAVITY COMP TQ	0	0.01	-20000 20000	
605	Sweep Torque Command Amplitude / P456 TQ AMPLITUDE	15		1 800	
606	Zero Clamp Level / P501 ZERO CLAMP LV	10	min^{-1}	0 10000	
607	Revolution Detecting Level / P502 ZERO SPEED LV	20	min^{-1}	1 10000	
608	Speed Correspondence Signal Detecting Width / P503 SPEED CMP WIDTH	10	min^{-1}	0 100	
609	Brake Command, Servo OFF Delay Time / P506 BK SV-OFF DELAY	0	10msec	0 50	
610	Brake Command Output Speed Level / P507 BK REF SPEED LV	100	min^{-1}	0 10000	
611	Servo OFF Brake Command Waiting Time / P508 SV-OFF BK DWL	50	10msec	10 100	
612	Momentary Hold Time / P509 BLACKOUT HOLD	20	msec	20 1000	
613	Input Signal Selection 1 / P50A INPUT ALT1	2100	hex		
614	Input Signal Selection 2 / P50B INPUT ALT2	6543	hex		
615	Input Signal Selection 3 / P50C INPUT ALT3	8888	hex		
616	Input Signal Selection 4 / P50D INPUT ALT4	8888	hex		
617	Output Signal Selection 1 / P50E OUTPUT ALT1	3211	hex		
618	Output Signal Selection 2 / P50F OUTPUT ALT2	0	hex		
619	Output Signal Selection 3 / P510 OUTPUT ALT3	0	hex		
620	Output Signal Reverse Setting / P512 OUTPUT REVERSE	0	hex		
621	Input Signal Selection 5 / P515 INPUT ALT5	6543	hex		
622	Warning Level of Excessive Position Deviation / P51E POS DEV WARNING	100		10 100	
623	Alarm Level of Excessive Position Deviation / P520 POS DEV ALARM	40000	COM UNIT	1 107341823(2^{30}-1)	
625	Near Signal Width / P524 NEAR SIG WIDTH	40000	COM UNIT	1 107341824(2^{30})	
626	Alarm Level of Excessive POS-DEV in Servo ON / P526 SVON P-D ALARM	40000	COM UNIT	1 107341823(2^{30}-1)	

No.	Name / Displayed Message	STD Set-value	Set Unit	Set Range	Remarks
627	Warning Level of Excessive POS-DEV in Servo ON / P528 SVON P-D WARNING	100		10 100	
628	Feed Limit Level in Servo ON / P528 SVON FEED LEVEL	10000	min⁻¹	0 10000	
629	Monitor Display in Power ON / P52F MONITOR DISPLAY	FFF			
630	Gain Limit / P540 GEIN LIMIT	2000	0.1Hz	10 20000	
631	Analog Monitor 1 Offset Voltage / P550 ANALOG MONITOR1	0	0.1V	-10000 10000	
632	Analog Monitor 2 Offset Voltage / P551 ANALOG MONITOR2	0	0.1V	-10000 10000	
633	Regeneration Resistance Capacity / P600 REG RES CAPA	0	10W		

Note1 This item may change in a setting value with attachment rotary tables. Although the setting value is indicated for every model below, detailed data should also combine the attached sheet parameter change list of rotary table equipments, and please confirm it. (mark in a table shows an "initial value".)

Moreover, A axis of an initial-setting value is rotary table form. It is a MRM60R type parameter value, and B axis is set as the parameter value of a TTM81 tilting axis.

			PRM 003	PRM 004	PRM 008	PRM 011	PRM 013	PRM 038	PRM 044	PRM 513
Initial value		A axis	41.66	41.66	41.66	72	0	1	0	350
		B axis	16.66	16.66	16.66	180	0	1	0	350
MRM	120	R	50.00	50.00	50.00	60	※	※	※	※
		L					1			
	200	R	33.33	33.33	33.33	90	※	※	※	※
		L					1			
	250	R	33.33	33.33	33.33	90	※	※	※	250
		L					1			
TMX	160		※	※	※	※	1	※	※	※
	200		33.33	33.33	33.33	90				
	250		25.00	25.00	25.00	120				
TBM	160/200		33.33	33.33	33.33	90	1	※	※	※
	250		25.00	25.00	25.00	120				
	320		16.66	16.66	16.66	180				
TUM	200		33.33	33.33	33.33	90	※	※	※	※
	251		25.00	25.00	25.00	120				
	320		16.66	16.66	16.66	180				
TMM	2100		83.33	83.33	83.33	36		0	※	※
	3100		50.00	50.00	50.00	60	1			
	2160		33.33	33.33	33.33	90		※		
	3160		25.00	25.00	25.00	120				
RSM	100	R	83.33	83.33	83.33	36	※	0	1	※
		L					1			
	160 200	R	33.33	33.33	33.33	90	※	※	※	※
		L					1			
TTM	101	A axis	※	※	※	※	※	※	※	※
		B axis	25.00	25.00	25.00	120	※	※	※	※
	120 181	A axis	33.33	33.33	33.33	90	※	※	※	※
		B axis	※	※	※	※	※	※	※	※
	251	A axis	25.00	25.00	25.00	120	※	※	※	※
		B axis	8.33	8.33	8.33	240	※	※	※	※

1.3   Detailed parameters

The set value in   on description for each parameter explanation shows the standard set value.

PRM000   N A M E   ROM Version
                M E S S A G E   ROM VER

Description The system program version of controller is inputted.

PRM002   N A M E   MZRN DECEL. speed
                M E S S A G E   MZRN LOW FEED
                DATA UNIT   min^{-1} DATA RANGE   0.00   1.00

Description Sets the feedrate for detecting MZRN dog.

MZRN DEC SIG
   DEC
                                                    IN CEL DOG DETCT.
NRL MZRN   PRM002
   PRM255   0   PRM008
2-STAGE MZRN   PRM002
   PRM255   0   × PRM255/100
                                          PRM002
ENCDR ZERO PULS SIG

                                              1 REV. OF MOTOR
1ST ZRO PLS AT NON-DETCT FRM DEC SIG
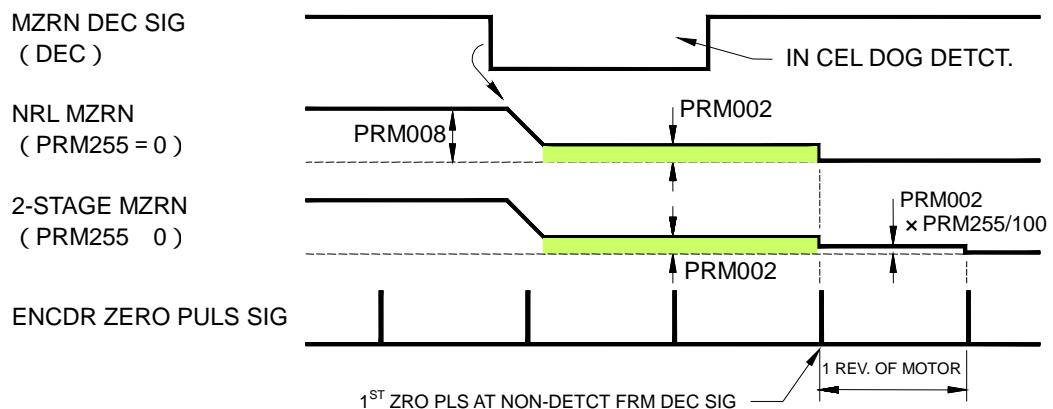
👉   Concerned parameters   PRM008   PRM255

PRM003   N A M E   Rapid Traverse   Max. rotation speed
                M E S S A G E   RAPID TRAVERSE
                DATA UNIT   min^{-1} DATA RANGE   0.00   99.99

Description Sets the max. rotation speed of circular table.

In the following case, the table rotates at max. rotation speed.

● When F0 is specified to the program feedrate or max. rotation speed is specified.

● When MAX value is specified at OVERRIDE.

● When WZRN is performed.

● When MZRN is performed after MZERO POS is established (PRM123=1).

PRM004

N A M E   JOG HI Speed
M E S S A G E   HI JOG FEED
DATA UNIT   min⁻¹   DATA RANGE   0.00   99.99

Description Sets the feedrate when the rapid traverse   **INS**   **HIJOG**, or **DEL**   **HIJOG**

is manually commanded.

Precautions
1. Even if the feed is set over PRM003, it is clamped at the upper limit value of PRM003.

PRM005

N A M E   JOG LO Speed
M E S S A G E   LO JOG FEED
DATA UNIT   min⁻¹   DATA RANGE   0.00   99.99

Description Sets the feedrate when LO JOG FEED   **INS**, or **DEL**   is manually commanded.

The LO JOG FEED is actuated when its key is continuously pushed for 1 second or more.

Precautions
1. Even if the feed is set over PRM003, it is clamped at the upper limit value of PRM003.

2. When the feed direction key is pushed for 1 second or less, the table is fed at the step feed.

PRM006

N A M E   Step Feed Amount
M E S S A G E   STEP FEED AMOUNT
DATA UNIT   deg   DATA RANGE   0.000   10.000

Description Sets the step feed amount of manual operation.

When **INS** or **DEL** is pushed for 1 second or less, the table is fed at step feed.

The step feedrate is PRM004   JOG HI FEED   .

Precautions
1. Even if the feed is set over PRM003, it is clamped at the upper limit value of PRM003.

2. When the feed direction key is pushed for 1 second or more, the table is fed at the LO JOG feed.

PRM007

N A M E   MZRN Shift Amount
M E S S A G E   MZRN SHIFT AMOUNT
DATA UNIT   deg   DATA RANGE   -360.000   360.000

Description MZRN POS. can be optionally shifted in DATA RANGE.

MZRN SHIFT is positioned at the feed of PRM003 as a serial operation.
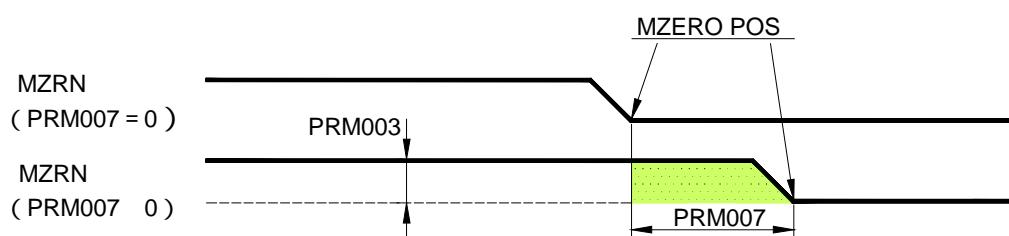
PRM008   N A M E   MZRN Feed
                  M E S S A G E   MZRN FEED
                  DATA UNIT   min^{-1} DATA RANGE   0.00   99.99

Description   Sets the MZRN FEED when PRM123=2 is set (DEC DOG MZRN).
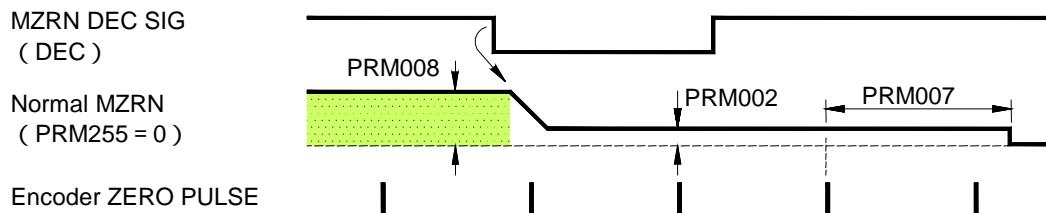
👉 Concerned parameters   PRM002   PRM007

PRM009   N A M E   Position Deviation Check Setting Time
                  M E S S A G E   POS-DEV CHECK TIMER
                  DATA UNIT   sec   DATA RANGE   0.00   1.00

Explained together at the following item of PRM010.

PRM010   N A M E   Position Deviation Check Setting Amount
                  MESSAGE   POS-DEV CHECK AMOUNT
                  DATA UNIT   deg   DATA RANGE   0.000   16.000

Description   The POS-DEV CHECK is started when the circular table is stopped in the imposition area.
The POS-DEV CHECK mode is the function to check that there is no error to the value set to PRM010 for the commanded value by checking the stop coordinate after positioning (PRM009 time elapsing).

PRM009 set time is used together with the time to table clamp from table entering time in the imposition.
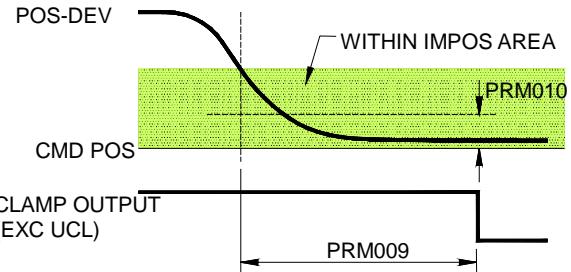
PRM011   N A M E   Gear Ratio 1/X
                  M E S S A G E   GEAR RATIO 1/X
                  DATA RANGE   0   36   45   999

Description   Sets the gear ratio between the circular table and the motor.

👉 Concerned parameters   PRM564   PRM565   AUTO SET

PRM013

N A M E   <u>Motor Rev. direction Flag</u>
M E S S A G E   MOTOR DIRECTION
DATA RANGE   0   1

Description Changes the rev. direction of motor (table).

     0   CW   Clockwise when viewed from motor shaft

     1   CCW   Counterclockwise when viewed motor shaft

PRM014

N A M E   <u>Override Step Amount</u>
M E S S A G E   OVERRIDE STEP AMOUNT
DATA UNIT   %   DATA RANGE   0   100

Description When pushing OVR   DEL   or   OVR   INS   simultaneously, the value of override can be increased or decreased. At this time, one increase or decrease amount is set.

PRM015

N A M E   <u>Deviation Check Amount in Clamp</u>
M E S S A G E   POS-DEV CHECK CLAMP
DATA UNIT   deg   DATA RANGE   0.000   16.000

Description The system checks the position deviation in table clamp and it allows Err.019 POS-DEV OVER CL to issue when the table is shifted over the set value by an external force. The parameter is set at ± value on the basis of a stop command position.
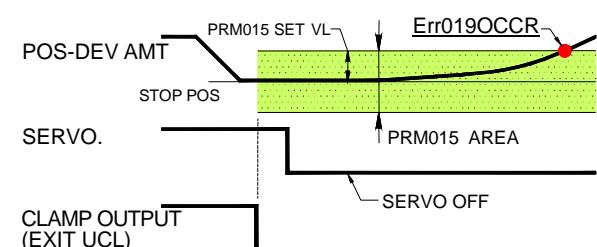
PRM016	N A M E	MZRN Direction
	M E S S A G E	MZRN DIRECTION
	DATA RANGE	0 1

Description Sets the MZRN direction of table.

| 0 | Direction | Clockwise when viewed from table top. |
| 1 | Direction | Counterclockwise when viewed from table top. |

MZRN Direction

PRM016=0	PRM016=1
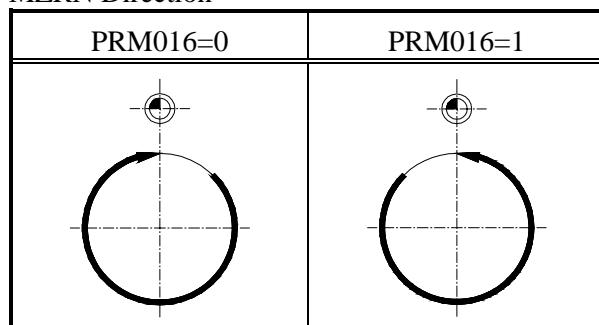
As shown in left figure, the table rotates in the rev. direction set to PRM016 even if MZRN start position is in any position.

Precautions

1. PRM016 is set as "Plus" when the table rotates in CW direction.

2. Unless PRM017=1   SHORT CUT MZRN   is set, MZRN is performed as set for this parameter.

☞ Concerned parameter   PRM017

PRM017	N A M E	MZRN WZRN in Short Cut Direction
	M E S S A G E	ZRN SHORT CUT DIR
	DATA RANGE	0 1 2

Description Sets whether MZRN or WZRN of table is performed or not in short cut direction, or the table returns to the zero position in the short cut direction by regarding the angle optionally set as boundary.

0
(A-axis standard)
The table returns to MZRN position in the direction set to PRM016 when returning from any position. It returns to WZRN position in the plus direction certainly.

☞   See Rev. direction of PRM016.
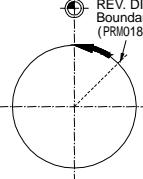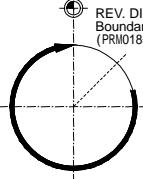
1
(B-axis standard)
The table returns to ZRN position in the short cut direction of CW at 180° or more and of CCW at below 180° by regarding the position of 180.000° as the boundary.

2
Optionally sets the boundary angle to be returned to ZRN position in the short cut direction.

MZRN direction in case of PRM017=1

Start pos.	MCRDT SYS 179.999° or less	MCRDT SYS 180.000° or more
RTRY DIR		
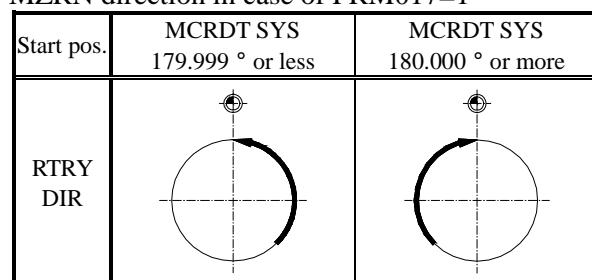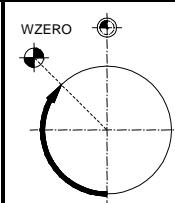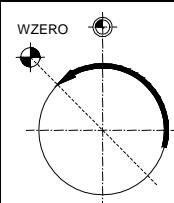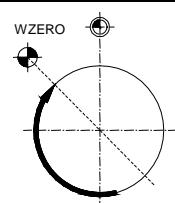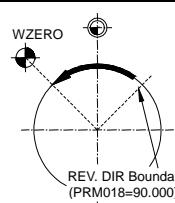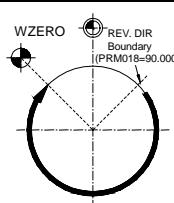
MZRN direction in case of PRM017=2

Set V	PRM018=45.000	
Start pos.	MCRDT SYS 45.000° or more	MCRDT SYS 45.000° or more
RTY DIR		

WZRN direction　　PRM016 set value is no concerned.

Set V	PRM017=0	PRM017=1		PRM017=2　　PRM018=90.000	
Start pos.	Regardless of position	WCRDT SYS 179.999° or less	WCRDT SYS 180.000° or more	WCRDT SYS 89.999° or less	WCRDT SYS 90.000° or more
RTY DIR					

Precautions

1.	In case of PRM17=1, 2, MZRN direction of PRM016 becomes invalid. For this reason, since a positioning error occurs by ZRN direction, it is recommended to use an unidirectional positioning mode.

☞　Concerned parameters　PRM016　PRM018

PRM018　　　　N A M E　　　　　Optional Angle Assignment in Short Cut Return Direction
　　　　　　　　M E S S A G E　　　　ZRN DIR OPT POS
　　　　　　　　DATA UNIT　　　deg　　　　　　DATA RANGE　　　0.000　359.999

Description　Determines the ZRN rev. direction by regarding an optional angle as boundary. In case of

PRM018　　　Current stop position, ZRN direction is CCW.

In case of PRM018　　　Current stop position, ZRN direction is CW.

However, in this rev. direction, CW rotation is regarded as plus direction.

☞　See the MZRN and WZRN rev. directions of PRM017.

Precautions

1.	When PRM017=2 is not set, even if the angle is set, it is invalid.
2.	The optional angle is reflected on the machine coordinate system in MZRN and on the work coordinate system in WZRN.

☞　Concerned parameter　PRM017

PRM020   N A M E   BLKFIN Output Flag in G08, G09
               M E S S A G E   BLKFIN FLAG (G08)
               DATA RANGE   0   1

Description Sets that BLKFIN is outputted at any timing in G80, G09.

    0   Outputs BLKFIN when G08 BLK EXE is started.

             (BLKFIN does not output when G09 BLK EXE is finished.)

    1   Outputs FLKFIN when G09 BLK EXE is finished.

             (BLKFIN does not output when G08 BLK EXE is started.)
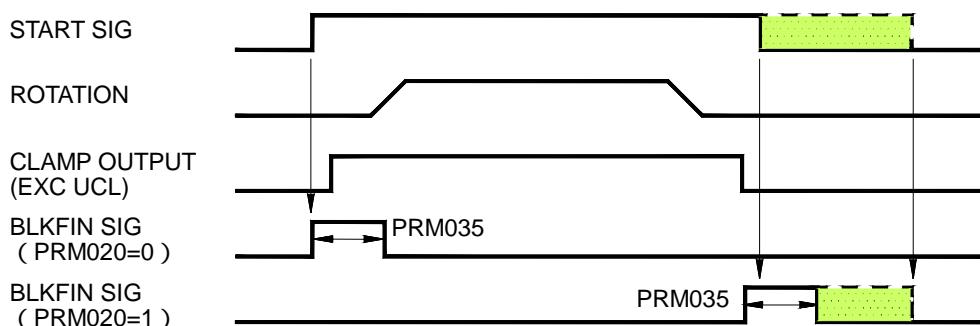
The FLKFIN OUTPUT time in PRM020=1 becomes PRM035 setting time when the start
signal is turned OFF within PRM035 time. When the start signal is not turned OFF even if
PRM035 time elapses, the BLKFIN is outputted continuously until the start signal is turned
OFF. (Part enclosed by dot line)

PRM021   N A M E   BLKFIN Output Flag in G07
               M E S S A G E   BLKFIN FLAG (G07)
               DATA RANGE   0   1

Description Sets that the BLKFIN OUTPUT mode of exclusive G07 (in lead cutting) in addition to an
usual BLKFIN OUTPUT is outputted at any timing.

    0   Outputs BLKFIN when G07 BLK EXE is finished.

    1   Outputs BLKFIN when G07 BLK EXE is started.
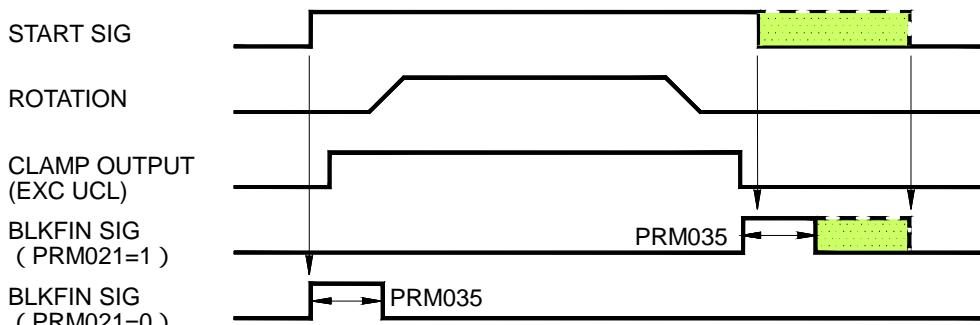
The FLKFIN OUTPUT time in PRM021=1 becomes PRM035 setting time when the start
signal is turned OFF within PRM035 time. When the start signal is not turned OFF even if
PRM035 time elapses, the BLKFIN is outputted continuously until the start signal is turned
OFF. (Part enclosed by dot line)

PRM022

N A M E   Object Signal of BLKFIN OUTPUT

M E S S A G E   BLKFIN TRIGGER

DATA RANGE   0   1

Description   Sets that the BLKFIN except G07　G08　G09 is outputted by any check.

       0   Clamp check signal monitoring　Valid only in PRM032=0

       1   Position deviation monitoring

PRM022=0　PRM038=1

ROTATION

PRM009

CLAMP OUTPUT
(EXC UCL)

CLAMP CHECK SIG
BK.C

UNCLAMP CHECK SIG
BK.UC

BLKFIN SIG

PRM022=0　PRM038=0

ROTATION

PRM009

CLAMP OUTPUT
(EXC UCL)

CLAMP CHECK SIG
BK.C

UNCLAMP CHECK SIG
BK.UC

BLKFIN SIG

PRM022=1

POS-DEV AMT

PRM009

CLAMP OUTPUT
(EXC UCL)

CLAMP CHECK SIG
BK.C
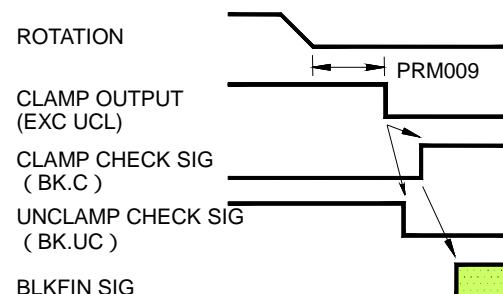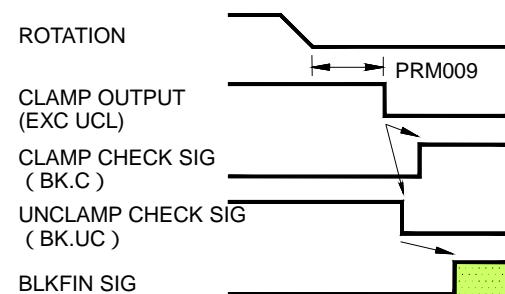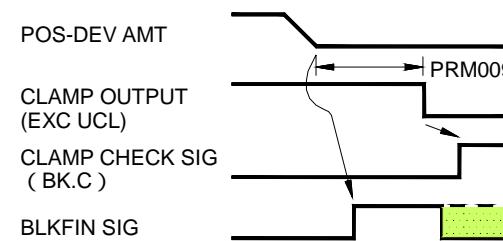
BLKFIN SIG

In PRM022=1, since BLKFIN signal is outputted by a position deviation amount, the BLKFIN signal can be outputted sooner than the type of PRM022=0.

However, there is any time without clamping after BLKFIN SIG OUTPUT (See left figure).

Precautions

1. In PRM022=0 (Clamp Check Signal Monitoring) setting, the check signal differs by the value set to PRM038. When PRM038=0, the table clamp is monitored by the clamp check signal and PRM038=1, monitored by the unclamp check signal.

In case of PRM032=1　Clamp unused　, POS-DEV amount is monitored forcedly.

☞   Concerned parameter   PRM038

PRM023   N A M E   Alarm Scan Cycle of Unclamp Signal
                    M E S S A G E   ALARM SCAN UNCLUMP
                    DATA UNIT   sec   DATA RANGE   0.00   10.00

Description The unclamp signal is monitored usually to set the detecting times for incorrect signals such as unclamp signal OFF during operation, unclamp signal ON during table clamp, etc. When the unclamp check signal fails over this set time, the alarm of   ERR016 BRAKE FAILURE   occurs.

REV.

CLAMP OUTPUT
(EXE UCL)

IN ABNRML   IN NRML

UNCLAMP CHECK SIG   CHECK   CHECK
BK.UC

IN ABNRML

When time is more than set value PRM023, Err016 occurs.
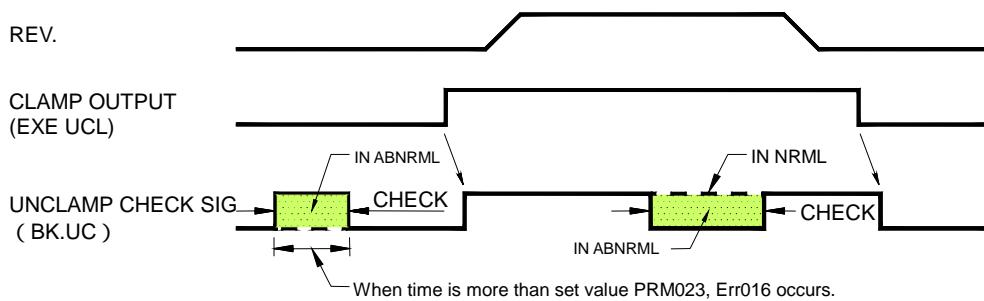
Precautions

1.   When PRM032=1(Clamp unused) or PRM038=1, this mode becomes invalid.
2.   In case of PRM023=0, the table is monitored by the unclamp check signal for only when operation START/STOP.

☞   Concerned parameters   PRM032   PRM038

PRM024   N A M E   Alarm Scan Cycle of Clamp Signal
                    M E S S A G E   ALARM SCAN CLAMP
                    DATA UNIT   sec   DATA RANGE   0.00   10.00

Description The clamp signal is monitored usually to set the detecting times for incorrect signals such as clamp signal ON during operation, clamp signal OFF during table clamp, etc.
When the clamp check signal fails over this set time, the alarm of   ERR016 BRAKE FAILURE   occurs.

REV.

CLAMP OUTPUT
(EXE UCL)

IN ABNRML   IN ABNRML

UNCLAMP CHECK SIG   CHECK   CHECK
BK.C

IN NRML

When time is more than set value PRM024, Err016 occurs.
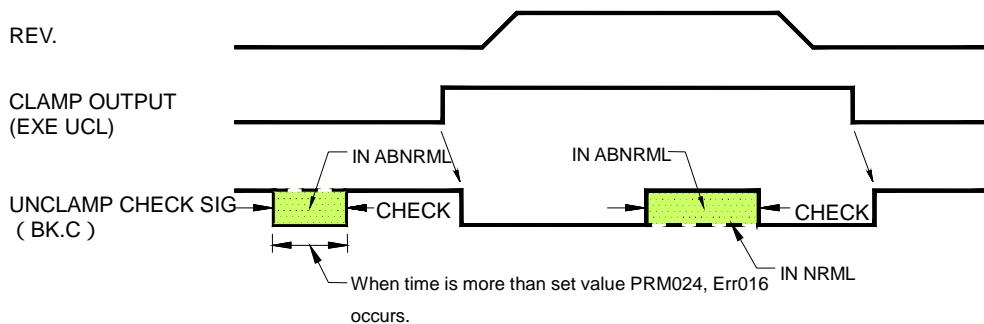
Precautions

1.   When PRM032=1 (Clamp unused) or PRM038=0, this mode becomes invalid.
2.   In case of PRM024=0, the table is monitored by the unclamp check signal for only when operation START/STOP.

☞   Concerned parameter   PRM038

PRM025

N A M E   360FIN Output Spec.

M E S S A G E   360FIN OUTPUT SPEC

DATA RANGE   0   1

Description   Selects the output format of 360FIN signal.

        0   One Shot OUTPUT

                Outputs 360FIN signal by a time set to PRM036 when the table stops at WZERO position or passes through its position.

        1   Continuous OUTPUT

                This mode monitors a current position usually, outputs 360FIN signal when the table is in set range (PRM026) and turns OFF the OUTPUT when the table is not in the set range.

                For detailed CONT. OUTPUT, see PRM026.

PRM025=0   In passing through WZERO POS.   PRM025=0   In stopping at WZERO POS.
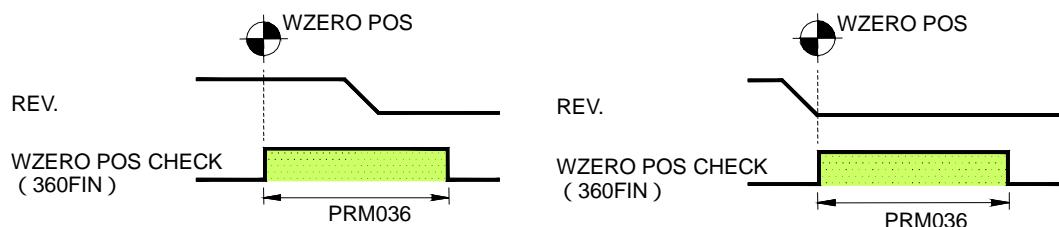
Precautions

1. To make this parameter valid, turn OFF power once.

☞   Concerned parameters   PRM026   PRM034

PRM026

N A M E   360° FIN Output Area

M E S S A G E   360FIN OUTPUT AREA

DATA UNIT   deg   DATA RANGE   0.000   1.000   (PRM025=1)

Description   Sets the OUTPUT AREA to output 360FIN continuously in PRM025=1.

          The PRM026 is set at ±range on the basis of WZERO position.
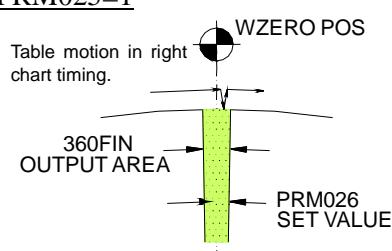
PRM025=1   Timing chart in operation as shown in left figure.
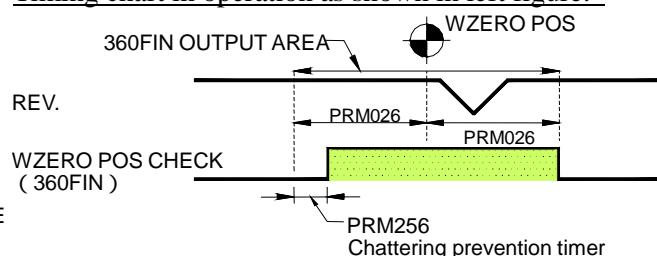
PRM027	N A M E	G99FIN Output Spec.
	M E S S A G E	G99FIN OPR SPEC
	DATA RANGE	0 1 2

Description   Sets that G99FIN is outputted at any timing when G98 and G99 commands are executed with the program.

This G99FIN can also be outputted continuously during solenoid excitation.

0	Outputs G99FIN when BLK EXE is finished.
1	Outputs G99FIN when BLK EXE is started (for 99FIN check.).
2	Outputs G99FIN during solenoid excitation.

PRM027=0
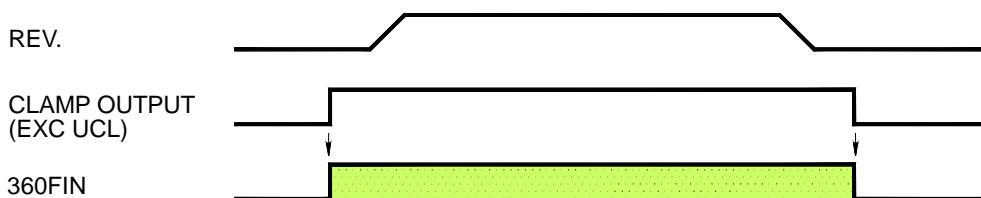
When start signal is not OFF within PRM035 time.

PRM027=2

Precautions

1. For G21L99 command, this parameter is invalid. When G21L99 is commanded, G99FIN is outputted when it is started.
2. PRM027=1 is set for only MAC mini iH series.

☞   Concerned parameters   PRM028   PRM029

PRM028   N A M E   G99FIN Check Timer

M E S S A G E   G99FIN CHECK TIMER

DATA UNIT   sec   DATA RANGE   0.00   9.99

Description   Sets a time checked to ZRN signal input that is the check signal when handshake (Checked by signal delivery) is executed with the external equipment.

When G98, G99 and G21L99 command blocks are executed, G99FIN is outputted and its G99FIN OUTPUT is turned OFF when the INPUT of ZRN signal   PRM029=" 2"   is checked. When the ZRN signal that is the G99 check signal is not inputted within this set time,   Err.217 G99FIN   TIME-OUT   occurs.

PRM027=1   PRM028   0   PRM029=2

When start signal is not OFF within PRM035 time.

START SIG

G99FIN (G99FIN)

ZRN INPUT signal (for checking G99)

BLKFIN SIG (BLKFIN)   PRM035
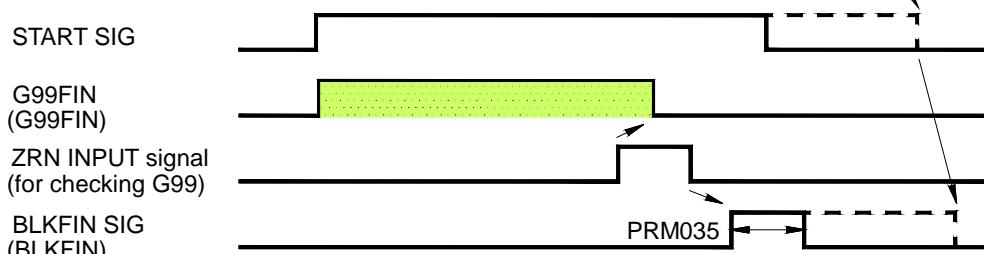
PRM027=1   PRM028   0   PRM029=2   In case of table rotation.

When start signal is not OFF within PRM035 time.
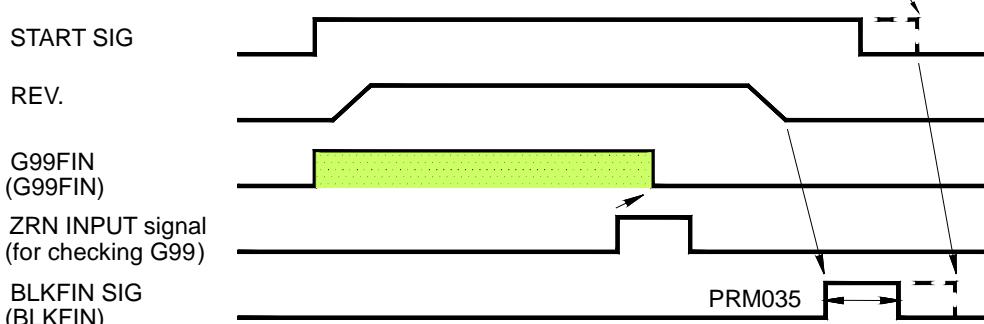
START SIG

REV.

G99FIN (G99FIN)

ZRN INPUT signal (for checking G99)

BLKFIN SIG (BLKFIN)   PRM035

Precautions

1.   For G21L99 command, this parameter is invalid. When G21L99 is commanded, G99FIN is outputted when it is started.

2.   When PRM028=0 or PRM029   2 is established when PRM027=1 is set,   Err.217 G99FIN   TIME-OUT   occurs.

☞   Concerned parameters   PRM027   PRM029

PRM029   N A M E   External ZRN Input Spec.

M E S S A G E   EXT ZRN SPEC

DATA RANGE   0   1   2

Description   Selects the specification of ZRN INPUT SIGNAL.

0   External MZRN

Performs MZRN by inputting ZRN in MANUAL mode.

1   External WZRN

Performs WZRN by inputting ZRN in MANUAL mode.

2   G99 CHECK SIGNAL (Only PRM027=1: VALID)

This parameter is used for receiving the CHECK SIGNAL to

G99FIN OUTPUT of PRM02.

When inputting ZRN for PRM028 time, G99FIN OUTPUT is

OFF.

For details of this item, see PRM028.

Precautions

> 1.   Since this function requires ZRN INPUT, only MAC mini iH series functions
> effectively.

☞   Concerned parameters   PRM027   PRM028

| **PRM030** |

N A M E   SP Signal Function Spec.

M E S S A G E   SP/EXT SP FUNC SPEC

DATA RANGE   0   1

Description   Selects the function when   **STOP**   key of panel or pendant and an external SP signal are

received during operation   AUTO   SINGLE   .

0   For SP INPUT, the table stops temporarily.

In STATUS, " RUN" + " STOP"   light.

1   For SP INPUT, STOP   Program RESET are performed.

In STATUS, " RESET"   lights.

| **PRM031** |

N A M E   External MZRN Function

M E S S A G E   MZRN BY THE EXT ST

DATA RANGE   0   1   2   3

Description   Sets whether MZRN is performed or not by the external start signal.

0   MZRN External Start INVALID

Just after power ON (STATUS: NOT READY), MZRN can be

performed by   **MZERO**   key operation on the panel or pendant, or an

external ZRN mode.

1   MZRN External Start available Type 1

The first External Start input signal, just after power turns on,

implements MZRN. And then after Machine return to the origin, it

automatically switches to AUTO mode. Additionally, in this type of

MZRN, MANUAL mode still outputs the signals of both BLKFIN and

ZRNFIN.

In case of 4th and 5th axes, both axes return to the origin at once.

2   MZRN External Start available Type 2

The first External Start input signal, just after power turns on, implements MZRN. And then after Machine return to the origin, it automatically switches to AUTO mode. Additionally, in this type of MZRN, MANUAL mode still outputs the signals of both BLKFIN and ZRNFIN.

In case of 4th and 5th axes, the 4th axis returns to the origin first and then the 5th axis returns to the origin afterward.

3   MZRN External Start available Type 3

The first External Start input signal, just after power turns on, implements MZRN. And then after Machine return to the origin, it automatically switches to AUTO mode. Additionally, in this type of MZRN, MANUAL mode still outputs the signals of both BLKFIN and ZRNFIN.

In case of 4th and 5th axes, the 5th axis returns to the origin first and then the 4th axis returns to the origin afterward.

Precautions

1.   When other measures, such as by Panel and External origin return, completes MZRN, this function becomes invalid.

☞   Concerned parameter   PRM029

PRM032   N A M E   Clamp Spec.
MESSAGE   CLAMP SPEC
DATA RANGE   0   1

Description   Selects whether the clamp mechanism of table is used or not.

0   Clamp mechanism used

1   Clamp mechanism unused

When the clamp mechanism is unused, the table becomes an unclamped state usually.

PRM033   N A M E   External Channel Spec.
MESSAGE   EXT CH SPEC
DATA RANGE   0   1

Description   Selects the method to select the program channel No. from external channels.

0   Rotary SW mode

1   M-signal mode

☞   Concerned parameters   PRM112
☞   See the item of   EXT CH SPEC   .

PRM034	N A M E	360FIN Output Contact Flag
	M E S S A G E	360FIN CONTACT FLAG
	DATA RANGE	0　1

Description　Selects the contact spec., of 360FIN OUTPUT SIGNAL.

> 0　　　　B-contact
>
> 1　　　　A-contact

PRM034=0 B-contact spec.　　In passing WZERO　　　PRM034=1 A-contact spec.　　In passing WZERO
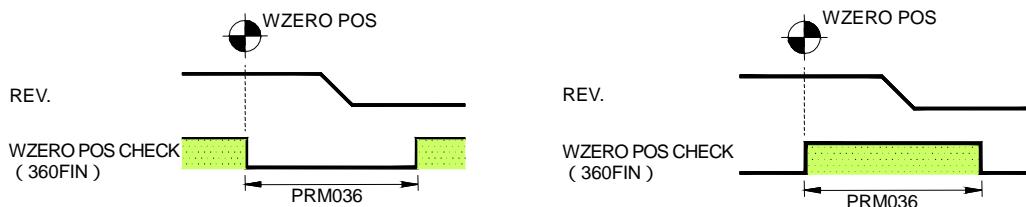
PRM035	N A M E	BLKFIN Timer
	M E S S A G E	BLKFIN TIMER
	DATA UNIT　　sec	DATA RANGE　　0.00　1.00

Description　Sets the output time of BLKFIN OUTPUT signal outputted in BLKFIN by the program operation under AUTO mode.

Start signal one shot type:　PRM035　0
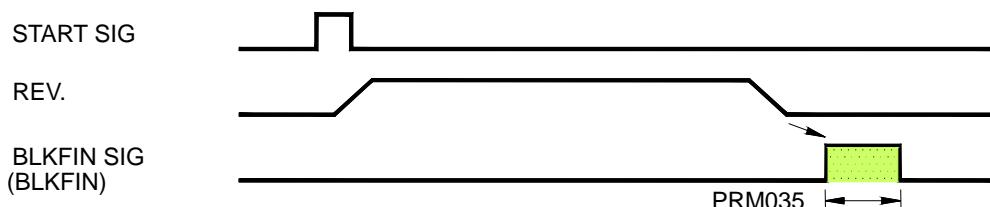
Start signal type turned OFF by BLKFIN:　PRM035　0

When start signal is not OFF within PRM035 time.
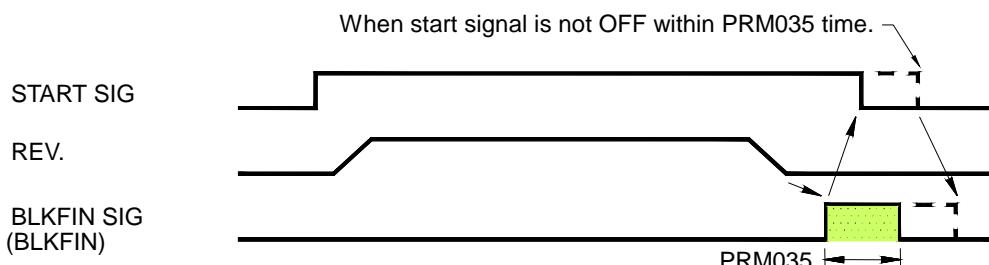
Start signal type turned OFF by BLKFIN:　PRM035　0
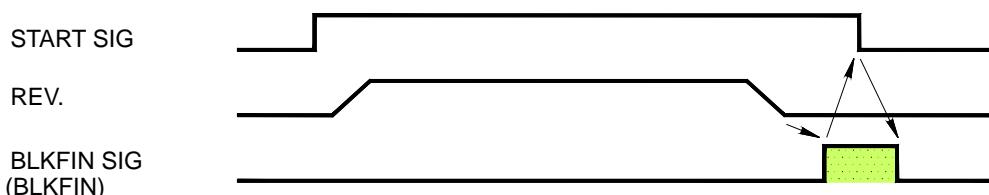
Precautions

1. In the BLKFIN OUTPUT, though a output time is the time set to PRM035 when the start signal is OFF in PRM035 time, when its signal is not OFF even if the time of PRM035 elapses, the BLKFIN is outputted continuously until the start signal is OFF.

2. When the parameter is used at PRM035　0, consider at the external equipment so that a next start signal will not be inputted during PRM035 output.
   If the start signal is inputted during BLKFIN output, its BLKFIN may be regarded as FIN SIGNAL, there is a possibility that an incorrect operation is caused.

3. When the start signal is inputted at one shot and PRM035=0 is set, the BLKFIN OUTPUT is ON/OFF immediately. For this reason, since the BLKFIN OUTPUT may not be read at the remote machine, set a proper output time.

PRM036

N A M E   360FIN Timer
M E S S A G E   360FIN TIMER
DATA UNIT   sec   DATA RANGE   0.00   1.00

Description Sets the output time of 360FIN OUTPUT signal when the table stops at MZERO position or passes through its position.

For timer operation, see the figure for PRM025=0.

Precautions

1. In case of PRM025=1, 2, the timer of this parameter becomes invalid.

☞ Concerned parameters   PRM025

PRM037

N A M E   Timer from Unclamp to Shift Start
M E S S A G E   ST   TIMER   FROM   UCL
DATA UNIT   sec   DATA RANGE   0.00   1.00

Description Sets the time from an unclamp motion to motor start.

Its time is used for adjusting the operation timing of the mounted machine and the table.

Precautions

1. When the brake is effective, the system is operated in order of   Brake Unclamp,   Servo ON,   Check of Servo ON OK/NG. It takes the time of about 100msec to finish the check of item   . Consequently, even if PRM037   PRM035 is set, it is nonsense.

PRM038

N A M E   Clamp Signal Flag
M E S S A G E   CLAMP SIGNAL FLAG
DATA RANGE   0   1

Description Selects whether the clamp check signal to check the clamp motion is used or not.

Even if the clamp check signal is not used, an unclamp check signal is usually checked.

　　0   Unused
　　1   Used

PRM039

N A M E   <u>Clamp Output Contact Flag</u>

M E S S A G E   BRAKE CONTACT FLAG

DATA RANGE   0   1

Description   Selects the clamp motion spec., by solenoid output.

         0   Excitation CLAMP

         1   Excitation UNCLAMP

<u>PRM039=0   Excitation CLAMP</u>   <u>PRM039=1   Excitation UNCLAMP</u>
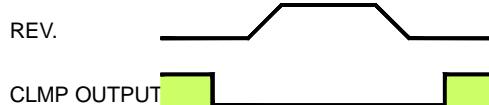
PRM040

N A M E   <u>Rev. Direction in Continuous Start (G22)</u>

M E S S A G E   REV DIR (G22)

DATA RANGE   0   1

Description   Sets the rev. direction when G22 (CONT. START) of program operation is commanded.

         0   CW   Clockwise

         1   CCW   Counterclockwise

Precautions

1. When " 0" or " 0" is set into Address A in program G22 commanded, the program command takes precedence and this setting becomes invalid.

PRM041

N A M E   <u>Rev. Feed in Continuous Start   G22</u>

M E S S A G E   REV FEED (G22)

DATA UNIT   min^{-1} DATA RANGE   0.00   99.99

Description   Sets the feedrate when the feedrate is not set into the program in G22 commanded (CONT. START).

Precautions

1. When Address F is set in program G22 commanded, the program command takes precedence and this setting becomes invalid.

PRM042

N A M E   <u>BLK/G99 FIN Output Start Delay Flag   G21</u>

M E S S A G E   BLK/G99 DELAY (G21)

DATA RANGE   0   1

Description   Sets whether the BLKFIN or G99FIN outputted when the program operation of G21 is started is delayed or not.

         0   Invalid

         1   Valid

PRM043

N A M E   BLK/G99 FIN Output Start Delay Timer   G21

M E S S A G E   BLK/G99 DELAY TIMER

DATA UNIT   sec   DATA RANGE   0.00   1.00

Description Sets the delay time of output set to PRM042.

PRM042=0 BLKFIN OUTPUT   PRM042=1 PRM043 0 BLKFIN OUTPUT
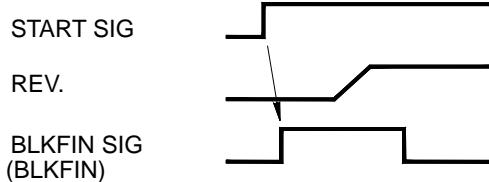
START SIG   START SIG

REV.   REV.

BLKFIN SIG   BLKFIN SIG
(BLKFIN)   (BLKFIN)   PRM043
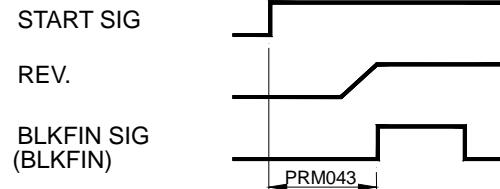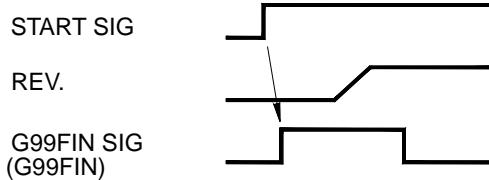
PRM042=0 G99KFIN OUTPUT   PRM042=1 PRM043 0 G99FIN OUTPUT

START SIG   START SIG

REV.   REV.

G99FIN SIG   G99FIN SIG
(G99FIN)   (G99FIN)   PRM043
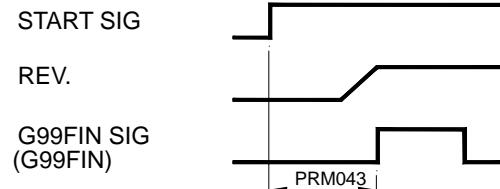
PRM044

N A M E   Servo Control Flag

M E S S A G E   SERVO CONTROL FLAG

DATA RANGE   0   1

Description Sets whether motor power is excited or not during clamp.

        0   Motor OFF in clamp

        1   Motor ON usually regardless of clamp

In this motor control, sequence differs by set value of PRM032.

	PRM032=0	PRM032=1
In Start	Motor ON in clamp.	Motor ON in clamp, after that, clamp OFF.
In Stop	Clamp ON in motor ON, and also, motor ON during stop.	Motor ON as is.
In Alarm Occurring	Motor OFF in alarm occurring, after resetting alarm, motor ON in clamp ON as is.	Motor OFF in alarm occurring, after resetting alarm, motor ON in clamp OFF as is.
In Motion Start	Motion start after setting PRM037 in clamp OFF.	

Precautions

1. Position deviation in clamp is held as POS-DEV AMOUNT.

2. In motor ON usually, when POS-DEV AMOUNT is not "0" and the table is clamped, the system attempts to return the POS-DEV to "0". As a result, current flows continuously to the motor, thus heating the motor.

PRM046   N A M E   Panel ST Key Input Flag in AUTO Mode
                   M E S S A G E   ST KEY IN AUTO
                   DATA RANGE   0   1

Description   Selects the VALID/INVALID of ST key input on the panel or pendant under AUTO mode.

         0   Valid   In the start INPUT, ST key input on the panel or pendant and ST of external INPUT are valid.

         1   Invalid   In the start INPUT in AUTO mode, only ST of external INPUT is valid.

PRM047   N A M E   WZERO Position Setting every Channel
                   M E S S A G E   SETUP WZERO POS
                   DATA RANGE   0   1

Description   Sets the specification of WZERO position when the manual WZERO position is set or G92 is executed.

         0   Common WZERO position for all channels

         1   Can set WZERO position every channel.

The following shows each operation content on PRM47.

		PRM047=0	PRM047=1
Setting of manual WZERO position ORG INPUT		Coordinate position stopped currently is updated to WZERO position. However, parameter does not change.	Current coordinate position is updated to WZERO position and parameter for channel during selection is also updated.
Program G92 command		WZERO position of OPT POS by Address A of G92 is updated. However, parameter does not change.	WZERO position is updated parameter for channel for selection is updated.
Change of CH		No change	Parameter for WZERO is read.
Change of PRM047	0 1	No change	
	1 0		No change

Precautions

1.   When changing PRM047 to "1" "0", the WZERO position of channel during selection in change becomes a common WZERO position.

☞   Concerned parameters   PRM300   PRM389   WZERO setting position every channel

PRM100   N A M E   <u>Software Limit Specification</u>
               M E S S A G E   S/W LIMIT SPEC
               DATA RANGE   0   1   2

Description Selects the specification of software to limit a machine operation range by the software.

        0   Invalid

        1   Check during operation

                 When the position coordinate during operation reaches a software limit
                 MIN (PRM101) and software limit MAX (PRM103) on the machine
                 coordinate system, an alarm occurs.

        2   Check before operation

                 The shifting destination coordinate is checked before operation in the
                 program operation. When the coordinate reaches a software limit MIN
                 (PRM101) and software limit MAX (PRM103) on the machine
                 coordinate system, an alarm occurs.

                 During manual feed, this mode is the same as check during operation
                 (PRM100=1).

        ☞   Concerned parameters   PRM101   PRM103

PRM101   N A M E   <u>Software Limit   MIN</u>
               M E S S A G E   S/W LIMIT OF MIN
               DATA UNIT   deg   DATA RANGE   0.000   359.999

Description Sets the machine coordinate position to limit a minus side when the software limit is valid
                (PRM100=1 or 2).

        ☞   Concerned parameters   PRM100   PRM103

PRM103   N A M E   <u>Software Limit   MAX</u>
               M E S S A G E   S/W LIMIT OF MAX
               DATA UNIT   deg   DATA RANGE   0.000   359.999

Description Sets the machine coordinate position to limit a plus side when the software limit is valid
                (PRM100=1 or 2).

        ☞   Concerned parameters   PRM100   PRM101

About software limit

Description   <u>PRM101=0.000   PRM103=180.000</u>   <u>PRM101=180.000   PRM103=0.000</u>
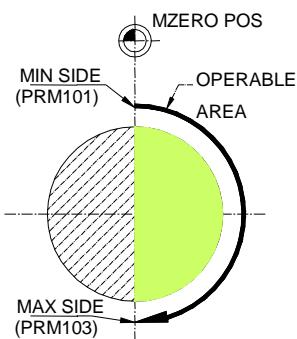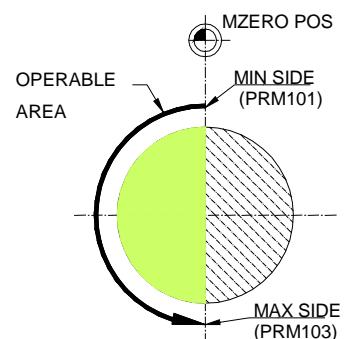
<u>PRM101=270.000   PRM103=90.000</u>   <u>PRM101=90.000   PRM103=270.000</u>
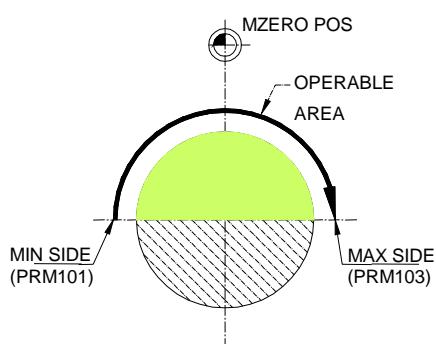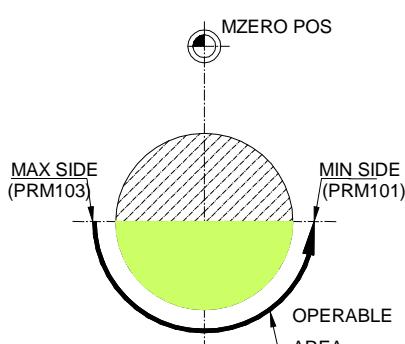
Precautions

1. The software limit mode becomes valid for only after MZRN is finished.
2. When operating in the plus direction or checking before operation,   Err.213 SOFTWARE LIMIT + (SOFTWARE LIMIT + Side)   occurs.
3. When operating in the plus direction or checking before operation,   Err.214 SOFTWARE LIMIT - (SOFTWARE LIMIT - Side)   occurs.
4. Though the above parameters PRM101=90.000   PRM103=270.000 can be set, the alarm occurs even if operated in any direction after MZRN is finished.

PRM105
N A M E   Unidirectional Positioning Spec.
M E S S A G E   UNIDIRECTIONAL SPEC
DATA RANGE   0   1   2

Description Sets that the table in program operation is positioned from any direction.

        0   Invalid
(A-axis standard)

        1   Direction positioning
(B-axis standard)   The table is usually positioned from the plus direction. When positioning from the minus direction, the table passes through a commanded position (Passing angle: PRM105) once, it reverses in the plus direction and approaches the commanded position.

        2   Direction positioning
                 The table is usually positioned from the minus direction. When positioning from the plus direction, the table passes through a commanded position (Passing angle: PRM105) once, it reverses in the minus direction and approaches the commanded position.
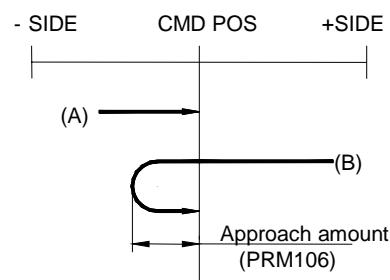
PRM105=1   PRM105=2
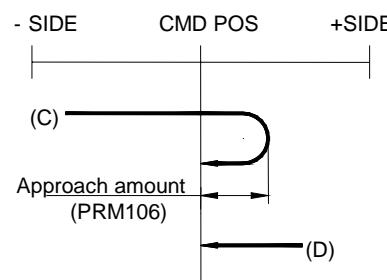
👉 Concerned parameter   PRM106

PRM106
N A M E   Unidirectional Positioning Approach Amount
M E S S A G E   UNIDIRECTIONAL ANGLE
DATA UNIT   deg   DATA RANGE   0.000   359.999

Description Sets the over travel (Approach) amount when returning after passing through a target value once with the unidirectional positioning VALID (PRM105=1 or 2).

👉 Concerned parameter   PRM105

PRM110
N A M E   Parameter INPUT Permission Flag
M E S S A G E   PRM INPUT PERMISSION
DATA RANGE   0   1   999

Description Sets the WRITE PERMISSION SPEC. when the parameter is set.

        0   Impossible parameter setting

        1   Parameter setting of PRM001   PRM499 is permitted.

                   Parameters relative to servo after PRM500 cannot be set.

      999   Permits all parameter settings.

Precautions

1. Do not change the servo parameter usually.

PRM112

N A M E   <u>Channel Select Flag</u>
M E S S A G E   CH SELECT FLAG
DATA RANGE   0   1

Description   Sets the method to select the channel.

     0   Selects the channel by the panel keys of controller.

     1   Selects the channel by the external INPUT signal.

             The channel select INPUT signals (CHSEL0 1 2 3 CHSET of a general purpose INPUT select each channel.

Precautions

1. When the channel selection is set by the external INPUT signal, it is necessary to select the mode of PRM033 together.

☞   Concerned parameter   PRM033

☞   For detailed contents, see the External Channel Selection .

PRM117

N A M E   <u>Axis Type</u>
M E S S A G E   AXIS TYPE
DATA RANGE   0   1

Description   The specification of a controller is set up.

     0   In 1-axis spec.   MAC mini iH / iHF(Initial-setting value)

     1   In 2-axis spec.   MAC mini iH2 / iHT(Initial-setting value)

☞   Concerned parameters   PRM240 PRM242 PRM243 PRM244

PRM121

N A M E   <u>Over Travel Detecting Type</u>
M E S S A G E   OT ADMIN TYPE
DATA RANGE   0   1

Description   Selects the specification of over travel detecting signal.

     0   Parallel detecting method

             OT is detected individually. OVRUN1 is used for the over travel signal of side and OVRUN2 for the over travel signal of side. When OT is detected, it is recognized that the received signal is in side or side. For this reason, an error occurs always during OT detecting. Unless the OT detecting mode is released, the error occurs immediately even if it is reset.

     1   Serial detecting method

             Inputs the OT detected value into only OVRUN1 at serial connection. The serial detecting function recognizes side or side by the shifting direction commanded when OT is detected. The direction of OT detected once is stored until OT is undetected and the table cannot be shifted in additional direction.

☞   For details, see Over Travel .

PRM122   N A M E   MZERO Position Setting Method
                M E S S A G E   ORG MODE SELECT
                DATA RANGE   0   1   2

Description Selects the setting method of MZERO position.

         0   Direct setting method

             After rotating the table to the position to be MZERO, the MZERO
             position is established by the parameter.

         1   Detector marker detecting method (Non-dog type)

             After shifting the machine to just before shift by 1 rev. of motor from
             the position to be MZERO and stopping it with the marker (C-phase) of
             detector on MZRN motion, the MZERO position is established.

         2   Dog type ZRN position setting method

             After detecting the DEC DOG with a proximity SW, decelerating and
             stopping it with the marker (C-phase) of detector, the MZERO position
             is established.

        ☞   For details, see   MZERO Setting   .

Precautions
1. To make this parameter valid, it is necessary to turn OFF the power once.

PRM123   N A M E   MZERO Position Establishing Flag
                M E S S A G E   ORG POS COMPLETE
                DATA RANGE   0   1

Description Determines that the MZERO position is established or unestablished.

         0   MZERO position Unestablished

             MZERO position is unestablished.
             In case of PRM123=0, ZERO POS setting is required.

         1   MZERO position Established

             MZERO position is established.
             In case of PRM122=0, the parameter is manually set and PRM122=1,2,
             parameters are automatically set.

        ☞   For details, see   MZERO Setting   .

Precautions
1. To make this parameter valid, it is necessary to turn OFF the power once.

PRM200   N A M E   Zero Pulse Mask Amount
               M E S S A G E   Z-PULSE MASK AMOUNT
               DATA UNIT   deg   DATA RANGE   0.000   9.999

Description Sets the angle area that ignores zero pulse (Absolute reference of motor encoder) to determine the motor in MZRN.
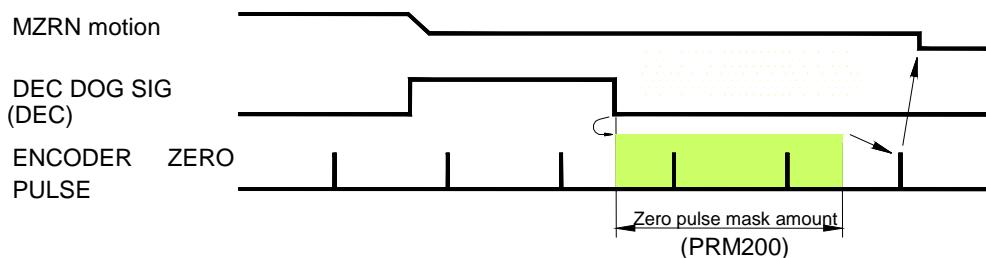
Precautions
1.   This parameter is not used in PRM122=0.

PRM203   N A M E   Backlash Compensation Amount
               M E S S A G E   BACKLASH COMP AMOUNT
               DATA UNIT   deg   DATA RANGE   0.000   9.999

Description Sets the backlash compensation amount of machine.

Precautions
1.   In usual power ON   OFF, since the backlash direction is remembered, this parameter is not influenced.
2.   To make this parameter valid, it is necessary to turn OFF the power once.

PRM206   N A M E   OV RUN Contact Type
               M E S S A G E   OV RUN CONTACT TYPE
               DATA RANGE   0   1

Description Sets the contact specifications of OVRUN1   2   Over Travel INPUT   .

        0   A-contact
(A-axis standard)

        1   B-contact
(B-axis standard)

Precautions
1.   To make this parameter valid, it is necessary to turn OFF the power once.

PRM208
PRM231

N A M E   Pitch Error Compensation
M E S S A G E   PITCH ERROR 01   PITCH ERROR 24
DATA UNIT   deg   DATA RANGE   -32.766   +32.766

Description Sets the pitch error compensation amount (Actually-measured value   Theoretical value) every 15° that divides one revolution   360°   of table   to 24-equipartition on the basis of MZERO position.

NO.	NAME	DESCRIPTION			
PRM208	PITCH ERR COM 01	Compensates for	0°	15°	of machine coordinate system.
PRM209	PITCH ERR COM 02	Compensates for	15°	30°	of machine coordinate system.
PRM210	PITCH ERR COM 03	Compensates for	30°	45°	of machine coordinate system.
PRM211	PITCH ERR COM 04	Compensates for	45°	60°	of machine coordinate system.
PRM212	PITCH ERR COM 05	Compensates for	60°	75°	of machine coordinate system.
PRM213	PITCH ERR COM 06	Compensates for	75°	90°	of machine coordinate system.
PRM214	PITCH ERR COM 07	Compensates for	90°	105°	of machine coordinate system.
PRM215	PITCH ERR COM 08	Compensates for	105°	120°	of machine coordinate system.
PRM216	PITCH ERR COM 09	Compensates for	120°	135°	of machine coordinate system.
PRM217	PITCH ERR COM 10	Compensates for	135°	150°	of machine coordinate system.
PRM218	PITCH ERR COM 11	Compensates for	150°	165°	of machine coordinate system.
PRM219	PITCH ERR COM 12	Compensates for	160°	180°	of machine coordinate system.
PRM220	PITCH ERR COM 13	Compensates for	180°	195°	of machine coordinate system.
PRM221	PITCH ERR COM 14	Compensates for	195°	210°	of machine coordinate system.
PRM222	PITCH ERR COM 15	Compensates for	210°	225°	of machine coordinate system.
PRM223	PITCH ERR COM 16	Compensates for	225°	240°	of machine coordinate system.
PRM224	PITCH ERR COM 17	Compensates for	240°	255°	of machine coordinate system.
PRM225	PITCH ERR COM 18	Compensates for	255°	270°	of machine coordinate system.
PRM226	PITCH ERR COM 19	Compensates for	270°	285°	of machine coordinate system.
PRM227	PITCH ERR COM 20	Compensates for	285°	300°	of machine coordinate system.
PRM228	PITCH ERR COM 21	Compensates for	300°	315°	of machine coordinate system.
PRM229	PITCH ERR COM 22	Compensates for	315°	330°	of machine coordinate system.
PRM230	PITCH ERR COM 23	Compensates for	330°	345°	of machine coordinate system.
PRM231	PITCH ERR COM 24	Compensates for	345°	360° (0°)	of machine coordinate system.

Precautions
1. The pitch error compensation becomes effective after MZRN.
2. MZRN is not compensated.
3. Since a minimum set unit is 0.001deg, the pitch error compensation less than this value is impossible.
4. The pitch error is compensated for only the target coordinate during program operation and it does not compensate in the middle way of trace.
5. When stopping at ALARM and STOP, the compensation is not performed.
6. In set angle area (15°), the set pitch error is compensated even if stopped at any positions.

☞ For details, see   Pitch Error Compensation   .

PRM240   N A M E   RS232C Communication Speed

                    M E S S A G E   RS232C BAUD RATE

                    DATA RANGE   0   1   2   3

Description   Sets the communication speed of comm. protocol.

                    0   2400 bps

                    1   4800 bps

                    2   9600 bps

                    3   19200 bps

Precautions   1.   To make this parameter valid, it is necessary to turn OFF the power once.

☞   Concerned parameters   PRM242   PRM243   PRM244

PRM242   N A M E   RS232C Data Length

                    M E S S A G E   RS232C DATA HEAD

                    DATA RANGE   0   1

Description   Sets the data length of communication protocol.

                    0   7 bit

                    1   8 bit

Precautions   1.   To make this parameter valid, it is necessary to turn OFF the power once.

☞   Concerned parameters   PRM240   PRM243   PRM244

PRM243   N A M E   RS232C Parity Bit

                    M E S S A G E   RS232C PARITY BIT

                    DATA RANGE   0   1

Description   Sets the parity bit of communication protocol.

                    0   Even

                    1   Uneven

                    2   None

Precautions   1.   To make this parameter valid, it is necessary to turn OFF the power once.

☞   Concerned parameters   PRM240   PRM242   PRM244

PRM244   N A M E   RS232C Stop Bit
               M E S S A G E   RS232C STOP BIT
               DATA RANGE   0   1

Description Sets the stop bit of communication protocol.
               0   2 bit
               1   1 bit

Precautions | 1.   To make this parameter valid, it is necessary to turn OFF the power once. |

👉   Concerned parameters   PRM240   PRM242   PRM243

PRM245   N A M E   Servo Parameter Check Function in Power ON
               M E S S A G E   SERVO PRM CHECK FUNC
               DATA RANGE   0   1   2

Description Selects the specifications of servo parameter to be checked when the power for the
               controller is turned ON.
               0   Communication YES   Parameter check YES
                        Checks that the servo parameter content stored in previous power OFF
                        is correct in power ON.
                        When there is incorrect content by the servo parameter check, the
                        parameter No. is communicated on the start screen in power ON and it
                        is automatically corrected into the stored servo parameter.
               1   Communication NO   Parameter check YES
                        Checks that the servo parameter content stored in previous power OFF
                        is correct in power ON.
                        Even if there is incorrect content by the servo parameter check, the
                        parameter No. is not communicated and it is automatically corrected
                        into the stored servo parameter.
               2   Parameter check NO
                        The servo parameter in power ON is not checked.
                        Even if the parameter does not correspond to the stored servo
                        parameter, it is not corrected.

Precautions | 1.   To make this parameter valid, it is necessary to turn OFF the power once.
               | 2.   This parameter functions from power OFF to next power ON. Therefore, the servo parameter can be changed during power ON. |

PRM250		

N A M E　　　　　Imposition Width

M E S S A G E　　　　IMPOSITION WIDTH

DATA UNIT　　　0.001deg　　　　　　DATA RANGE　　　0　32767

Description　When the slippage of machine position stopped by program operation and a commanded position (absolute value of position deviation amount) is smaller than the imposition width, it is regarded as the case that the machine reaches the commanded position, thereby setting the imposition width of positioning completion.

However, the table rotates at the commanded position in place of the positioning-completed width.
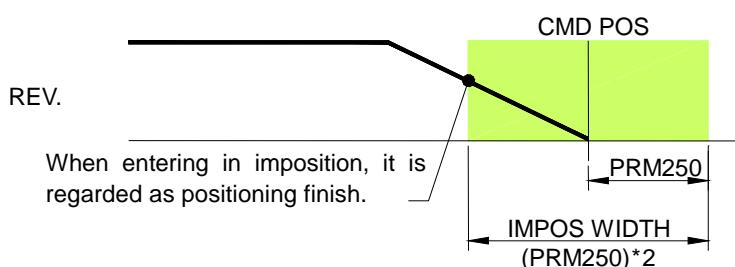
PRM251		

N A M E　　　　　Constant 1 in Acceleration/Deceleration

M E S S A G E　　　　ACC/DEC CONSTANT 1

DATA UNIT　　　msec　　　　　　DATA RANGE　　　0　1000

Description　Sets the T1-time of ACC/DEC.
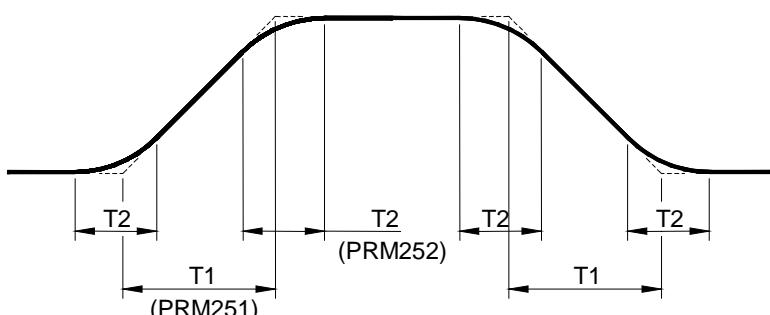
☞　Concerned parameter　PRM252

PRM252		

N A M E　　　　　Constant 2 in Acceleration/Deceleration

M E S S A G E　　　　ACC/DEC CONSTANT 2

DATA UNIT　　　msec　　　　　　DATA RANGE　　　1

Description　Sets the T2-time of ACC/DEC.

Precautions

1. Since the TC2 of constant 2 in ACC/DEC is fixed to 1msec., it becomes the linear acceleration/deceleration actually.

☞　Concerned parameter　PRM251

PRM253　　N A M E　　　　Enable Switch Flag

M E S S A G E　　　ENABLE SW FLAG

DATA RANGE　　　0　1

Description　Sets the VALID/INVALID of ENABLE SW mounted on the pendant.

　　　　　　0　　　INVALID

　　　　　　1　　　VALID

Precautions

1. In case of no pendant spec., though a standard set value becomes "0", in case of pendant spec., the standard set value becomes "1".

PRM255　　N A M E　　　　MZRN Dead Slow Speed Percent

M E S S A G E　　　MZRN 2TH FL RATE

DATA UNIT　　%　　　　　　DATA RANGE　　　0　100

Description　Sets the percent of 2nd stage deceleration speed in MZRN.

The percent for value set to PRM002 is provided.

See the explanatory drawing of PRM002 for operation.

☞　　Concerned parameter　PRM002

PRM256　　N A M E　　　　360° FIN Chattering Prevention Timer

M E S S A G E　　　360FIN CHATTERING

DATA UNIT　　SEC　　　　　DATA RANGE　　　0.0　1.0

Description　Though 360FIN is outputted when PRM025 1 is set, this CONT. OUTPUT is started after checking that the table exists for PRM256-time in PRM026-set area. Thus, this timer is provided to prevent the chattering in area.
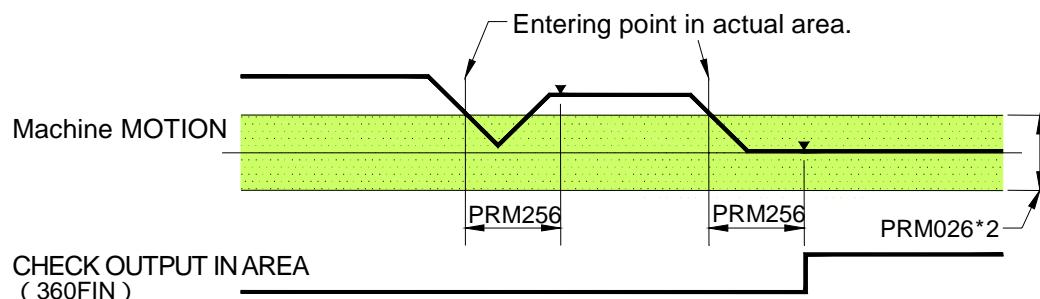
☞　　Concerned parameters　PRM025　PRM026

PRM257

N A M E   MZRN Mode
M E S S A G E   HMODE
DATA UNIT   sec

Description   Sets the value relative to MZRN. However, since the value is fixed, it cannot be changed.

PRM258

N A M E   MZRN Time-out
M E S S A G E   MZRN TIME-OUT
DATA UNIT   sec
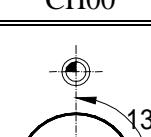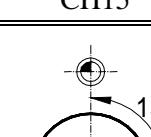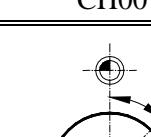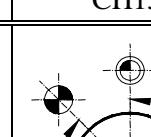
Description   Sets the time to make the time-out when MZRN is not finished because of any reason in MZRN. However, the time is fixed, it cannot be changed.

| PRM300 |
| PRM389 |

N A M E   WZERO Position Every Channel
M E S S A G E   WZERO POSITION CH00   WZERO POSITION CH89
DATA UNIT   deg   DATA RANGE   0.000   359.999

Description   Sets the WZERO position every channel based on MZERO position.
Maximum 90 channels can be set to PRM300   PRM389.

Common WZERO position   135.000 in PRM047=0 and
WZERO positions when PRM300(CH00)=45.000   PRM315(CH15)   315.000 are set.

Condi-tions	PRM047=0 WZERO POS INVALID every channel		PRM047=1 WZERO POS VALID every channel	
Call CH	CH00	CH15	CH00	CH15
WZERO POS				

Precautions

1.   When   Sets WZERO POS every channel.   of PRM047=1 is selected, WZERO position every channel becomes valid.

☞   Concerned parameter   PRM047

PRM390

N A M E　　　　　　Channel/Block Structure Spec.
M E S S A G E　　　　CH/BLOCK CONFIG SPEC
DATA RANGE　　　　0　1　2

Description　Selects the spec., of channel/block structure.

When the expansion channel function is used, the function to check whether the existed program fails or not for the newly set Channel/Block structure is selected to USED/UNUSED.

　　　　0　　　　Standard channel/block structure
　　　　　　　　CH00　500 block, CH01　CH15　100 block structure
　　　　1　　　　When Channel/Block are optionally set with the expansion channel function, the program is checked.
　　　　2　　　　When Channel/Block are optionally set with the expansion channel function, the program is not checked.

☞　Concerned parameters　PRM400　489
☞　For details, see　　Expansion Channel　.

| PRM400 |
PRM489

N A M E　　　　　　Number of Blocks every Channel
M E S S A G E　　　　BLOCKS OF CH00　　　BLOCKS OF CH89
DATA UNIT　　BLOCK　　　　　　DATA RANGE　　0　1000

Description　When channels or blocks are changed with the expansion channel function, the number of blocks is set every channel.

Precautions

1. In PRM390=1 or 2, this parameter becomes valid.
2. The channel that the number of blocks is set to "0" and the channel after its channel cannot be selected.

☞　Concerned parameter　PRM390
☞　For details, see　　Expansion Channel　.

Parameters relative to servo control

Though the parameters relative to servo for the controller are described below, do not change the parameters.

PRM506   N A M E   Function Select Switch 6
                 M E S S A G E   P006 APPLICATION SW6
                 DATA UNIT   hex   DATA RANGE   000   409

Description   Selects the analog monitor content of servo motor.

Corresponds to the parameter Pn006 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

Pn006.0   Analog monitor 1 signal selection

Pn006.1   00   Motor rev. speed   DC1V/1000min^{-1}

          01   Speed command   DC1V/1000min^{-1}

          02   Torque command   DC1V/100%

          03   Position deviation   DC0.05V/1 command unit

          04   Pos. amp. deviation   DC0.05V/1 encoder pulse unit

          05   Pos. command speed   DC1V/1000min^{-1}

          06   Reservation

          07   Reservation

          08   Pos. FIN command   POS FIN   5V   POS UNFIN   0V

          09   Speed feed forward   DC1V/100

Pn006.2   Analog monitor 1 signal factor selection

          00   1-time

          01   10-time

          02   100-time

          03   1/10-time

          04   1/100-time

Remarks

Analog monitor 1 OUTPUT voltage

(-1) × Signal select (PRM506.0) × Signal factor (PRM506.2)   +OFFSET voltage (PRM631)

☞   Concerned parameter   PRM631

PRM507

N A M E   <u>Function Select Switch</u>

M E S S A G E   P007 APPLICATION SW7

DATA UNIT   hex   DATA RANGE   000   409

Description

Selects the analog monitor content of servo motor.

Corresponds to the parameter Pn007 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

Pn007.0   Analog monitor 1 signal selection

Pn007.1	00	Motor rev. speed DC1V/1000min^{-1}
	01	Speed command DC1V/1000min^{-1}
	02	Torque command DC1V/100%
	03	Position deviation DC0.05V/1 command unit
	04	Pos. amp. deviation DC0.05V/1 encoder pulse unit
	05	Pos. command speed DC1V/1000min^{-1}
	06	Reservation
	07	Reservation
	08	Positioning finish command Positioning finish 5V Positioning unfinished 0V
	09	Speed feed forward DC1V/100

Pn07.2	Analog monitor 1 signal factor selection	
	00	1-time
	01	10-time
	02	100-time
	03	1/10-time
	04	1/100-time

Remarks

Analog monitor 1 OUTPUT voltage

   $(-1) \times$ Signal select (PRM507.0) $\times$ Signal factor (PRM507.2)   +OFFSET voltage (PRM632)

☞   Concerned parameter   PRM632

PRM508

N A M E   <u>Function Select Switch</u>

M E S S A G E   P008 APPLICATION SW8

DATA UNIT   hex   DATA RANGE   0   1

Description

Selects the analog monitor content of servo motor.

Corresponds to the parameter Pn008 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

Pn008.0   ALARM/WARNING   selection of battery voltage drop

       0   Battery voltage drop is regarded as ALARM (A.830).

       1   Battery voltage drop is regarded as WARNING (A.930).

Pn008.1   Single phase of three-phase INPUT mode

       0   Three-phase INPUT mode is used by three-phase INPUT mode.

Pn008.2   Warning detection selection

       0   Detects WARNING.

PRM510	N A M E	Speed Loop Gain		
	M E S S A G E	P100 SPEED LOOP GAIN		
	DATA UNIT	0.1Hz	DATA RANGE	10 20000

Description   Sets the responsibility of servo motor to control speed.

Corresponds to the parameter Pn100 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM511	N A M E	Speed Loop Integration Time Constant		
	M E S S A G E	P101 SLG INTEGRATION		
	DATA UNIT	0.01msec	DATA RANGE	15 51200

Description   This is the user constant to determine the responsibility of speed loop.

Corresponds to the parameter Pn101 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

Precautions

1. When the responsibility of speed loop is low, since the position loop on outside becomes a delay factor, overshoot occurs or vibration speed command occurs. Therefore, it is recommended to set the value as higher as possible at area that the machine system does not vibrate. As a result, the servo system is stable and the responsibility is increased.

PRM512	N A M E	Position Loop Gain		
	M E S S A G E	P102 POS LOOP GAIN		
	DATA UNIT	0.1/sec	DATA RANGE	10 20000

Description   The responsibility of position loop is determined by the position loop gain.

Corresponds to the parameter Pn102 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

Precautions

1. When the position loop gain can be set to high value, the responsibility becomes high and the positioning time becomes short. However, it is impossible to increase the position loop gain over a natural frequency.

PRM513	N A M E	Moment Ratio of Inertia		
	M E S S A G E	P103 INERTIA RATIO		
	DATA UNIT	%	DATA RANGE	1 20000

Description   When fixture carried in rotary table , the case where work is large, and the center of gravity have shifted, vibration and roar sound may occur in rotary table .

Inertia ratio $\dfrac{\text{Load inertia of motor shaft conversion } (J_L)}{\text{Rotor inertia of servo motor } (J_M)} \times 100(\%)$

Corresponds to the parameter Pn103 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM514   N A M E   2nd Speed Loop Gain
              M E S S A G E   P104 2TH S-LOOP GAIN
              DATA UNIT   0.1Hz   DATA RANGE   10   20000

Description   Sets the responsibility of servo motor when speed is controlled.

Corresponds to the parameter Pn104 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM515   N A M E   Constant in 2nd Speed Loop Integration
              M E S S A G E   P105 2TH SLG INTE
              DATA UNIT   0.01msec   DATA RANGE   15   51200

Description   Sets the responsibility of servo motor when speed is controlled.

Corresponds to the parameter Pn105 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM516   N A M E   2nd Position Loop Gain
              M E S S A G E   P106 2TH POS L-GAIN
              DATA UNIT   0.1/sec   DATA RANGE   10   20000

Description   Sets the responsibility for position control.

Corresponds to the parameter Pn106 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM517   N A M E   Bias
              M E S S A G E   P107 BIAS
              DATA UNIT min^{-1} DATA RANGE   0   450

Description   The time established for positioning can be shortened by giving the bias for the speed command part.

Corresponds to the parameter Pn107 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

☞   Concerned parameters   PRM518

PRM518   N A M E   Bias Adding Width
              M E S S A G E   P108 BIAS ADD WIDTH
              DATA UNIT   0.001deg   DATA RANGE   0   250

Description   The bias adding width is the value that indicates the timing adding the bias at a deviation pulse. When the deviation pulse exceeds the set value of bias adding width, the bias is added.

Corresponds to the parameter Pn108 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

☞   Concerned parameter   PRM517

Bias function	When the pulse of deviation counter exceeds the bias adding width (PRM518), this function adds the bias amount (PRM517) to the output (speed command: SP CMD) of deviation counter and it stops the adding bias value when reaching the bias adding width. For this reason, the counted pulse of deviation counter is reduced, thus shortening a positioning time. When the bias amount is largest, the motor rotation becomes unstable. Since an optimum value varies by load, gain and bias adding width, adjust the value, watching the reply. When the bias function is not used, set PRM517 to "0".
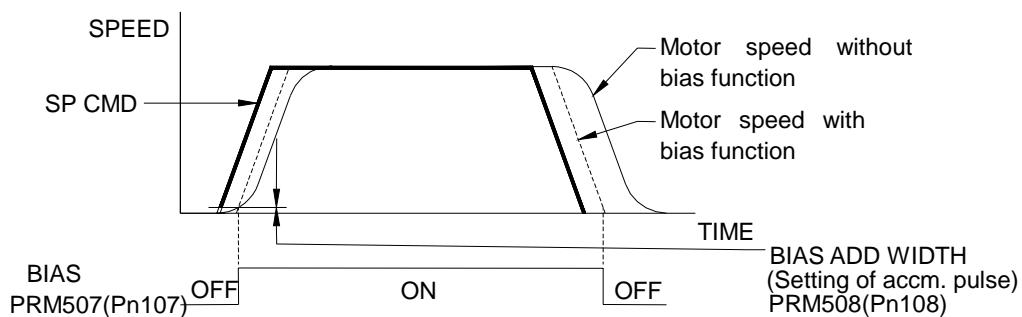
PRM519   N A M E   Feed Forward
M E S S A G E   P109 FEED-FORWARD
DATA UNIT   %   DATA RANGE   0   100

Description   The positioning time is shortened by compensating the FEED FORWARD for the position control.
Corresponds to the parameter Pn109 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM520   N A M E   Constant in Feed Forward Filter
M E S S A G E   P10A F-F FILTER
DATA UNIT   0.01msec   DATA RANGE   0   6400

Description   The positioning time is shortened by compensating the FEED FORWARD for the position control.
Corresponds to the parameter Pn10A of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM522   N A M E   Mode Switch (Torque Command)
M E S S A G E   P10C MODE-SW(TRQUE)
DATA UNIT   %   DATA RANGE   0   800

Description   When the torque is commanded over PRM522, the speed loop becomes "Proportional Control".
This mode controls to overshoot or undershoot the motor speed because the torque in ACC/DEL is saturated.
Corresponds to the parameter Pn10C of servo pack SGDS made by YASKAWA ELECTRIC CORP.

☞   Concerned parameters   PRM521   (Valid in Pn10B.0=0)

PRM527

N A M E   Speed Feedback Compensation
M E S S A G E   P111 SPEED FEEDBACK
DATA UNIT   %   DATA RANGE   1   500

Description   When using the speed feedback compensation function, the speed loop gain or position loop gain is increased, thus shortening the positioning setting time.
Corresponds to the parameter Pn111 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM528

N A M E   Command Filter Gain
M E S S A G E   P119 CMD FILTER GAIN
DATA UNIT   0.1/sec   DATA RANGE   10   20000

Description   Corresponds to the parameter Pn119 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM529

N A M E   Command Filter Gain Compensation
M E S S A G E   P11A F-GAIN COMP
DATA UNIT   0.1/sec   DATA RANGE   500   2000

Description   Corresponds to the parameter Pn11A of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM530

N A M E   Command Filter Bias (CW)
M E S S A G E   P11E F-BIAS(CW)
DATA UNIT   0.1%   DATA RANGE   0   10000

Description   Corresponds to the parameter Pn11E of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM531

N A M E   Position Integration Time Constant
M E S S A G E   P11F POS INTEGRATION
DATA UNIT   0.1%   DATA RANGE   0   50000

Description   Corresponds to the parameter Pn11F of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM532

N A M E 3rd Speed Loop Gain
M E S S A G E   P12B 3TH S-LOOP GAIN
DATA UNIT   0.1/sec   DATA RANGE   10   20000

Description   Corresponds to the parameter Pn12B of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM533

N A M E 3rd Loop Integration Time Constant
M E S S A G E   P12C 3TH SLG INTE
DATA UNIT   0.1Hz   DATA RANGE   15   51200

Description   Corresponds to the parameter Pn12C of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM534	N A M E	3rd Position Loop Gain		
	M E S S A G E	P12D 3TH POS L-GAIN		
	DATA UNIT	0.1msec	DATA RANGE	10 20000

Description   Corresponds to the parameter Pn12D of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM535	N A M E	4th Speed Loop Gain		
	M E S S A G E	P12E 4TH S-LOOP GAIN		
	DATA UNIT	0.1/sec	DATA RANGE	10 20000

Description   Corresponds to the parameter Pn12E of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM536	N A M E	4th Loop Integration Time Constant		
	M E S S A G E	P12F 4TH SLG INTE		
	DATA UNIT	0.1Hz	DATA RANGE	15 51200

Description   Corresponds to the parameter Pn12F of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM537	N A M E	4th Position Loop Gain		
	M E S S A G E	P130 4TH POS L-GAIN		
	DATA UNIT	0.1msec	DATA RANGE	10 20000

Description   Corresponds to the parameter Pn130 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM538	N A M E	Gain Change Time 1		
	M E S S A G E	P131 GAIN CHANGE T1		
	DATA UNIT	1msec	DATA RANGE	0 65535

Description   Corresponds to the parameter Pn131 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM539	N A M E	Gain Change Time		
	M E S S A G E	P132 GAIN CHANGE T2		
	DATA UNIT	1msec	DATA RANGE	0 65535

Description   Corresponds to the parameter Pn132 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM540	N A M E	Gain Change Wait Time 1		
	M E S S A G E	P135 GAIN WAIT T1		
	DATA UNIT	1msec	DATA RANGE	0 65535

Description   Corresponds to the parameter Pn135 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM541

N A M E	Gain Change Wait Time 2
M E S S A G E	P136 GAIN WAIT T2

DATA UNIT	1msec	DATA RANGE	0	65535

Description   Corresponds to the parameter Pn136 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM543

N A M E	Command Filter Bias (CCW)
M E S S A G E	P144 CMD F-BIAS(CCW)

DATA UNIT	0.1%	DATA RANGE	0	10000

Description   Corresponds to the parameter Pn144 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM545

N A M E	Prediction Control ACC/DECEL Gain
M E S S A G E	P151 PREDICTION GAIN

DATA UNIT	%	DATA RANGE	0	300

Description   Performs the prediction control using an inputted position command.
Corresponds to the parameter Pn151 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM546

N A M E	Prediction Control Dignity Ratio
M E S S A G E	P152 DIGNITY RATIO

DATA UNIT	%	DATA RANGE	0	300

Description   Performs the prediction control using a future position command.
Corresponds to the parameter Pn152 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM547

N A M E	Servo Rigidity
M E S S A G E	P1A0 SERVO RIGIDITY

DATA UNIT	%	DATA RANGE	0	500

Description   Corresponds to the parameter Pn1A0 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM548

N A M E	Servo Rigidity
M E S S A G E	P1A1 SERVO RIGIDITY2

DATA UNIT	%	DATA RANGE	0	500

Description   Corresponds to the parameter Pn1A1 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM549

N A M E	Speed Feedback Filter Time Constant
M E S S A G E	P1A2 SPEED F/B FLT

DATA UNIT	0.01msec	DATA RANGE	30	3200

Description   Corresponds to the parameter Pn1A2 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM550   N A M E   Speed Feedback Filter Time Constant 2

               M E S S A G E   P1A3 SPEED F/B FLT2

               DATA UNIT   0.01msec   DATA RANGE   30   3200

Description Corresponds to the parameter Pn1A3 of servo pack SGDS made by YASKAWA ELECTRIC
                CORP.

PRM551   N A M E   Torque Command Filter Time Constant 2

               M E S S A G E   P1A4 TQ FILTER2

               DATA UNIT   0.01msec   DATA RANGE   0   2500

Description Corresponds to the parameter Pn1A4 of servo pack SGDS made by YASKAWA ELECTRIC
                CORP.

PRM553   N A M E   Auxiliary Integration Gain

               M E S S A G E   P1A9 AUX INTE GAIN

               DATA UNIT   Hz   DATA RANGE   0   500

Description Corresponds to the parameter Pn1A9 of servo pack SGDS made by YASKAWA ELECTRIC
                CORP.

PRM554   N A M E   Position Ratio Gain

               M E S S A G E   P1AA POS RATIO GAIN

               DATA UNIT   Hz   DATA RANGE   0   500

Description Corresponds to the parameter Pn1AA of servo pack SGDS made by YASKAWA ELECTRIC
                CORP.

PRM555   N A M E   Feed Integration Gain

               M E S S A G E   P1AB FEED INTE GAIN

               DATA UNIT   Hz   DATA RANGE   0   500

Description Corresponds to the parameter Pn1AB of servo pack SGDS made by YASKAWA ELECTRIC
                CORP.

PRM556   N A M E   Feed Ratio Gain

               M E S S A G E   P1AC FEED RATIO GAIN

               DATA UNIT   Hz   DATA RANGE   0   2000

Description Corresponds to the parameter Pn1AC of servo pack SGDS made by YASKAWA ELECTRIC
                CORP.

PRM563   N A M E   Position Command ACC/DECL Bias

               M E S S A G E   P209 POS REF BIAS

               DATA UNIT   1-command unit/sec   DATA RANGE   0   65535

Description Corresponds to the parameter Pn209 of servo pack SGDS made by YASKAWA ELECTRIC
                CORP.

PRM567	N A M E	Backlash Compensation Amount
	M E S S A G E	P214 BACKLASH
	DATA UNIT	Command unit DATA RANGE -32767 32767

Description Sets a backlash compensation amount.
Corresponds to the parameter Pn214 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM568	N A M E	Backlash Compensation Time Constant
	M E S S A G E	P215 BACKLASH TC
	DATA UNIT	0.01msec DATA RANGE 0 65535

Description Corresponds to the parameter Pn215 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM569	N A M E	Position Command ACC/DEC Time Constant
	M E S S A G E	P216 POS-REF A/D
	DATA UNIT	0.01msec DATA RANGE 0 65535

Description Corresponds to the parameter Pn216 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM571	N A M E	Speed Command Input Gain
	M E S S A G E	P300 SPEED REF GAIN
	DATA UNIT	0.01V/Rated speed DATA RANGE 150 3000

Description The feed forward function shortens the positioning time. When the feed forward is too applied, overshoot and under shoot occur.
Corresponds to the parameter Pn300 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM575	N A M E	JOG Feed
	M E S S A G E	P304 JOG FEED
	DATA UNIT	min^{-1} DATA RANGE 0 10000

Description Sets the motor rotary speed when the motor is rotated under the operation mode by panel operator or digital operator.
Corresponds to the parameter Pn304 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM576	N A M E	Soft Start Acceleration Time
	M E S S A G E	P305 SOFT ACC TIME
	DATA UNIT	msec DATA RANGE 0 10000

Description The step type "Speed Command" INPUT mode rotates the servo motor smoothly at a constant acceleration speed inside of servo pack. At this time, the time from motor-stopped state to max. motor rotary speed is set.
Corresponds to the parameter Pn305 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM577	N A M E	Soft Start Deceleration Time

M E S S A G E   P306 SOFT DEC TIME

DATA UNIT   msec   DATA RANGE   0   10000

Description The step type "Speed Command" INPUT mode rotates the servo motor smoothly at a constant deceleration speed inside of servo pack. At this time, the time from max. motor rotary speed to motor stop state is set.
Corresponds to the parameter Pn306 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM578   N A M E   Speed Command Filter Time Constant

M E S S A G E   P307 SPEED REF FLT

DATA UNIT   0.01msec   DATA RANGE   0   65535

Description Primary delay filter is applied to the analog speed command to make the speed command smooth.
If a large value is set, responsibility becomes wrong.
Corresponds to the parameter Pn307 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM579   N A M E   Speed F/B Filter Time Constant

M E S S A G E   P308 SPEED F/B FLT

DATA UNIT   0.01msec   DATA RANGE   0   65535

Description The primary delay filter is set to the speed feedback of speed loop. At this time, the feedback becomes smooth and vibration also becomes small.
If a large value is set, it becomes a delay factor, thus resulting in a poor responsibility.
Corresponds to the parameter Pn308 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM584   N A M E   1st No. 1 Torque Command Filter Time Constant

M E S S A G E   P401 TORQUE REF FLT

DATA UNIT   0.01%   DATA RANGE   0   65535

Description This parameter is changed when the machine vibrates because of servo drive damage.
When parameter number is smaller, good responsible control can be made.
This corresponds to parameter Pn401 of SGDS of YASKAWA ELECTRIC CO.

PRM585   N A M E   Clockwise Torque Limitation

M E S S A G E   P402 CW TORQUE LMT

DATA UNIT   %   DATA RANGE   0   800

Description Limits a max. value of OUTPUT torque on CW side.
Corresponds to the parameter Pn402 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM586   N A M E   Reverse Torque Limit
              M E S S A G E   P403 CCW TORQUE LMT
              DATA UNIT   %   DATA RANGE   0   800

Description Limits the max. value of OUTPUT torque on reverse side.
Corresponds to the parameter Pn403 of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

PRM587   N A M E   External Torque Limit on CW Side
              M E S S A G E   P404 CW EXT T-LMT
              DATA UNIT   %   DATA RANGE   0   800

Description Limits the max. value of OUTPUT torque on CW side preset at the external contact
INPUT.
Corresponds to the parameter Pn404 of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

PRM588   N A M E   External Torque Limit on CCW Side
              M E S S A G E   P405 CCW EXT T-LMT
              DATA UNIT   %   DATA RANGE   0   800

Description Limits the max. value of OUTPUT torque on CCW side preset at the external contact
INPUT.
Corresponds to the parameter Pn405 of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

PRM592   N A M E   1st Stage Notch Filter Frequency
              M E S S A G E   P409 1TH NOTCH FLT
              DATA UNIT   Hz   DATA RANGE   50   2000

Description Sets a machine frequency.
Corresponds to the parameter Pn409 of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

PRM593   N A M E   1st Stage Notch Filter Q-value
              M E S S A G E   P40A 1TH NOTCH FLT
              DATA UNIT   0.01   DATA RANGE   50   1000

Description Because the machine vibration is restricted, if overshoot occurs, adjust it with Q-value.
Corresponds to the parameter Pn40A of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

PRM594   N A M E   2nd Stage Notch Filter Frequency
              M E S S A G E   P40C 2TH NOTCH FLT
              DATA UNIT   Hz   DATA RANGE   50   2000

Description Sets a machine vibration frequency.
Corresponds to the parameter Pn40C of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

PRM595   N A M E   2nd Notch Filter Q-value

MESSAGE   P40D 2TH NOTCH FLT

DATA UNIT   0.01   DATA RANGE   50   1000

Description   When overshoot occurs even if machine vibration is restricted, adjust it with Q-value.
Corresponds to the parameter Pn40D of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

PRM602   NAME   Vibration Suppression Damping Ratio in Stop

MESSAGE   P420 V-CTL RATIO

DATA UNIT   %   DATA RANGE   10   100

Description   This function reduces the servo gain during stop in order to suppress vibration during stop.
This function is effective for the vibration during stop. However, it does not correspond to
the vibration during shift.
Corresponds to the parameter Pn420 of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

PRM603   NAME   Vibration Suppression Start Ratio in Stop

MESSAGE   P421 V-CTL START

DATA UNIT   msec   DATA RANGE   0   65535

Description   The inside servo gain is performed at the rate of PRM602 after the time of this timer
elapses from Position Command =0.
Corresponds to the parameter Pn421 of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

PRM604   NAME   Gravity Compensation Torque

MESSAGE   P422 GRAVITY COMP TQ

DATA UNIT   0.01%   DATA RANGE   -20000   20000

Description   Corresponds to the parameter Pn422 of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

PRM605   NAME   Sweep Torque Command Amplitude

MESSAGE   P456 TQ AMPLITUDE

DATA UNIT   %   DATA RANGE   1   800

Description   Corresponds to the parameter Pn456 of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

PRM607   NAME   Revolution Detecting Level

MESSAGE   P502 ZERO SPEED LV

DATA UNIT min^{-1} DATA RANGE   0   10000

Description   Sets the rev. speed to detect the revolution when judged as during motor rotation.
Corresponds to the parameter P502 of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

PRM608	N A M E	Speed Correspondence Signal Detecting Width
	M E S S A G E	P503 SPEED CMP WIDTH
	DATA UNIT min⁻¹	DATA RANGE 0 100

Description When the difference of a speed command and a actually rotated speed of motor is less than the set value, the speed correspondence output is issued.
Corresponds to the parameter P503 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM612	N A M E	Momentary Hold Time
	M E S S A G E	P509 BLACKOUT HOLD
	DATA UNIT msec	DATA RANGE 20 1000

Description When the power voltage supply to the servo pack is momentarily OFF, the servo pack detects this blackout and turns OFF the servo. At this time, a momentary OFF time is set. When this time is less than the set time, operation is continued as is. When it is more than the set time, the servo is turned OFF.
Corresponds to the parameter P509 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM622	N A M E	Warning Level of Excessive Position Deviation
	M E S S A G E	P51E POS DEV WARNING
	DATA UNIT %	DATA RANGE 10 100

Description This is the factor of calculation when an excessive position deviation alarm occurs.
Corresponds to the parameter Pn51E of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM623	N A M E	Alarm Level of Excessive Position Deviation
	M E S S A G E	P520 POS DEV ALARM
	DATA UNIT Command unit	DATA RANGE 1 107341823(2^{30}-1)

Description This is the factor for calculation when the excessive position deviation alam occurs.
Corresponds to the parameter P520 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM625	N A M E	Near Signal Width
	M E S S A G E	P524 NEAR SIG WIDTH
	DATA UNIT Command unit	DATA RANGE 1 107341824(2^{30})

Description Sets the width for near output to show where the servo motor is in near SHIFT CCOMPlATION point.
Corresponds to the parameter P524 of servo pack SGDS made by YASKAWA ELECTRIC CORP.

PRM626	N A M E	Alarm Level of Excessive POS-DEV in Servo ON		
	M E S S A G E	P526 SVON P-D ALARM		
	DATA UNIT	Command unit	DATA RANGE	1 107341823(2^{30}-1)

Description Issues an alarm when the POS-DEV pulse exceeds this set value in servo ON.
Corresponds to the parameter P526 of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

PRM627	N A M E	Warning Level of Excessive POS-DEV in Servo ON		
	M E S S A G E	P528 SVON P-D WARNING		
	DATA UNIT	%	DATA RANGE	10 100

Description Issues a warning mode when the POS-DEV pulse exceeds this set value in servo ON.
Corresponds to the parameter P528 of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

PRM628	N A M E	Feed Limit Level in Servo ON		
	M E S S A G E	P529 SVON FEED LEVEL		
	DATA UNIT	min^{-1}	DATA RANGE	0 10000

Description Limits speed at this set mode when the servo is ON with position deviation pulses saved.
Corresponds to the parameter P529 of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

PRM630	N A M E	Gain Limit		
	M E S S A G E	P540 GAIN LIMIT		
	DATA UNIT	0.1Hz	DATA RANGE	10 20000

Description Corresponds to the parameter P540 of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

PRM631	N A M E	Analog Monitor 1 Offset Voltage		
	M E S S A G E	P550 ANALOG MONITOR1		
	DATA UNIT	0.1V	DATA RANGE	-10000 10000

Description Offsets the analog monitor content with PRM506.
Corresponds to the parameter P550 of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

PRM632	N A M E	Analog Monitor 2 Offset Voltage		
	M E S S A G E	P551 ANALOG MONITOR2		
	DATA UNIT	0.1V	DATA RANGE	-10000 10000

Description Offsets the analog monitor content with PRM507.
Corresponds to the parameter P551 of servo pack SGDS made by YASKAWA ELECTRIC
CORP.

2   ORG MODE Selection

2.1.   To set ORG MODE

How to set MZERO that is the machine reference of circular table is divided into the following three methods.

- ➢ Direct setting method MZRN position   PRM122=0

    After rotating the table to the position to be MZERO, MZRN position is established.

- ➢ Detector marker detecting method (Non-dog type)   PRM122=1

    After shifting the machine to the place just before shifting by one revolution of motor from the place to be MZERO, the MZRN position is established at the place where the machine is stopped with the detector marker (C-phase) on MZRN motion.

- ➢ Dog type ZERO POS setting method   PRM122=2

    The proximity SW detects a deceleration dog and the MZRN position is established at the place where the machine is stopped with the detector marker (C-phase) on MZRN motion after decelerating.

These MZRN position setting methods are changed with parameters.

When MZRN is required, the controller displays "Err.400   MZERO POS UN-SETUP".
The case required for MZRN is as follows:
- ➢ The encoder cable is removed from the motor.
- ➢ With the back-up battery gone out, the power of controller is turned OFF.
- ➢ The set value of PRM123 is set to "0".
- ➢ The set value of gear ratio of PRM011 is changed.

2.2.   Directly setting method

The following explains the steps to set ORG POS directly.

2.2.1.
Directly setting of
ORG MODE

→ Push **MODE** to select   MANUAL   .
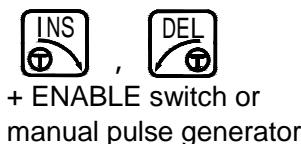
→ Shift the table manually to the angle to be MZRN position.

+ ENABLE switch or
manual pulse generator

→ Push **MODE** to select   PARAM   .

→ Set "1" to PRM110 so that any parameter can be written.
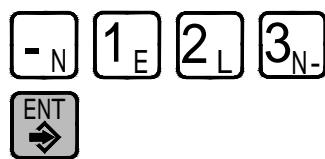
→ Call the ORG POS COMPLET parameter.

→ Set the set value of parameter to " 1" to establish the ORG POS.

→ │INPUT│ is pushed and a power supply is turned off.

When setting the MZERO position directly, set the ORG POS COMPLETE parameter to "0".

With ORG POS COMPLETE parameter set to "1", when MZERO position is established, STATUS   READY   LED lights.

When setting PRM123=1 of ORG POS COMPLETE, " Err.091   POWER OFF ALARM"   is displayed and power is turned OFF.

A setup of PRM123 cannot perform A axis and B axis simultaneously. After 1 axis setup, please carry out power supply OFF/ON and also set up another axis.

2.3.   Detector marker detecting method (Non-dog type)

The following explains the steps to set the ORG MODE SELECT with the marker of motor encoder.

2.3.1
Detector marker detecting set

→ Push **MODE** to select MANUAL .

+ ENABLE switch or manual pulse generator

→ Shift the table by one revolution of motor to the place just before the position to be MZRN position.

+ ENABLE switch

→ Detect MZERO with the marker at deceleration speed PRM002 .
When the marker detecting is performed on shift motion, the table stops immediately and ORG POS COMPLETE parameter set value is automatically set to "1", thus establishing MZERO position.

When setting ORG MODE SELECT directly, set the ORG POS COMPLETE parameter to "0".

When the ORG POS COMPLETE parameter is automatically set to "1", STATUS READY LED lights.

When MZERO is established by MZRN, " Err.091 POWER OFF ALARM" and POWER OFF are required and displayed.

Angle by one revolution of motor differs by gear ratio.

Gear ratio	1/36	1/60	1/72	1/90	1/120	1/180	1/360
Angle by one revo. of motor °	10	6	5	4	3	2	1

2.4.   Dog type ORG MODE Selection

The following explains the steps to set the MZERO position with the marker of motor encoder at DECEL. Dog.

2.4.1
Dog type ORG MODE Selection

MODE

→ Push **MODE** to select   MANUAL   .

MZERO

+ ENABLE switch

→ Perform MZRN.

When the DECEL. dog is detected, the table becomes deceleration speed and the table stops immediately with the marker after DECEL. Dog non-detecting and the ORG POS COMPLETE parameter is set to "1", thus establishing MZERO position.

When setting ORG MODE SELECT directly, set the ORG POS COMPLETE parameter to "0".

When the ORG POS COMPLETE parameter is automatically set to "1", STATUS   READY   LED lights.

When MZERO is established by MZRN, "Err.091   POWER OFF ALARM" and POWER OFF are required and displayed.

3   Pitch Error Compensation

3.1   Outline

Setting the pitch error data can compensate the pitch error at 0.001° unit for a symmetric axis.

The PITCH ERROR can be set as a compensation reference position of MZERO position every given interval 15°.

3.2   Parameter setting

The PITCH ERROR mode divides one revolution of circular table into 24 and the parameter is allocated in order at section every15 . Thus, the compensation value is set for the parameter of section required for pitch error.

3.2.1. Parameters

The parameter is allocated on the basis of MZERO position every 15° block clockwise as shown in the following figure.

The parameter is set by the difference data (Actually measured value Theoretical value) for the pitch error.
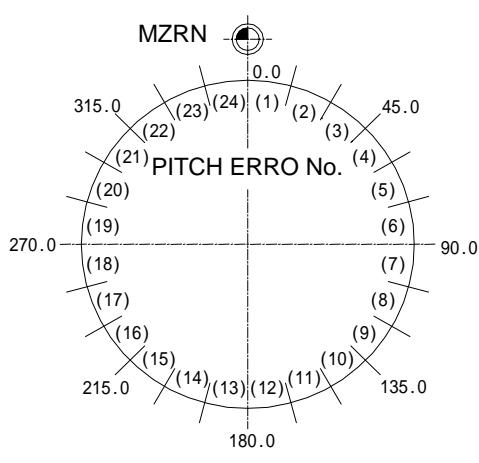
Offset No.	PRM No.	Offset No.	PRM No.
1	PRM208	(13)	PRM220
2	PRM209	(14)	PRM221
3	PRM210	(15)	PRM222
4	PRM211	(16)	PRM223
5	PRM212	(17)	PRM224
6	PRM213	(18)	PRM225
7	PRM214	(19)	PRM226
8	PRM215	(20)	PRM227
9	PRM216	(21)	PRM228
10	PRM217	(22)	PRM229
11	PRM218	(23)	PRM230
(12)	PRM219	(24)	PRM231

3.2.2.
Parameter setting
examples

The following explains the parameter setting method according to the

following reference examples.

Measured example   Data measured every 5°.

SFT Ang.	Mesu. V	SFT Ang.	Mesu. V	SFT Ang.	Mesu. V	SFT Ang.	Mesu. V
0.000	0.000	90.000	90.015	180.000	180.001	270.000	269.985
5.000	5.000	95.000	95.015	185.000	185.000	275.000	274.986
10.000	10.001	100.000	100.014	190.000	190.000	280.000	279.988
15.000	15.001	105.000	105.014	195.000	194.999	285.000	279.988
20.000	20.002	110.000	110.012	200.000	199.999	295.000	294.989
25.000	25.004	115.000	115.009	205.000	204.998	300.000	299.989
30.000	30.005	120.000	120.010	210.000	209.997	305.000	304.990
35.000	35.005	125.000	125.009	215.000	214.995	310.000	309.993
40.000	40.006	130.000	130.007	220.000	219.994	315.000	314.992
45.000	45.005	135.000	135.007	225.000	224.993	320.000	319.994
50.000	50.007	140.000	140.006	230.000	229.990	325.000	324.993
55.000	55.008	145.000	145.005	235.000	234.988	330.000	329.994
60.000	60.008	150.000	150.004	240.000	239.988	335.000	334.996
65.000	65.009	155.000	155.002	245.000	244.986	340.000	340.000
70.000	70.010	160.000	160.001	250.000	249.987	345.000	344.998
75.000	75.012	165.000	165.002	255.000	254.987	350.000	350.001
80.000	80.012	170.000	170.000	260.000	259.985	355.000	354.999
85.000	85.014	175.000	175.000	265.000	264.986	360.000	360.000

Position-slipped data
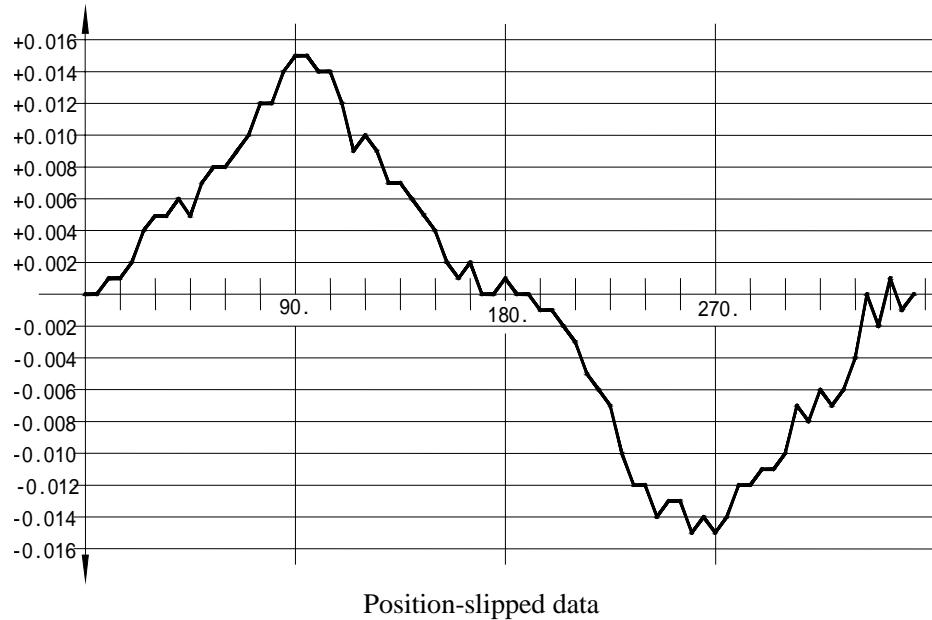
When set on basis of pos. every 15° from meas. example data. (Colored data)

Pitch error No.	PRM No.	Offset	Pitch error No.	PRM No.	Offset	Pitch error No.	PRM No.	Offset
1	208	0.000	9	216	+0.010	17	224	-0.012
2	209	+0.001	10	217	+0.007	18	225	-0.013
3	210	+0.005	11	218	+0.004	19	226	-0.015
4	211	+0.005	12	219	+0.002	20	227	-0.012
5	212	+0.008	13	220	+0.001	21	228	-0.010
6	213	+0.012	14	221	-0.001	22	229	-0.006
7	214	+0.015	15	222	-0.003	23	230	-0.004
8	215	+0.014	16	223	-0.007	24	231	+0.001

After compensating pitch error
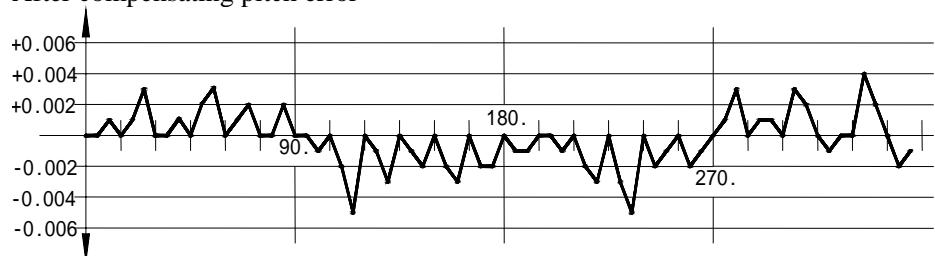
When setting average value every 15° from meas. example data.

Example　PRM209 Set value =(Error of shift angle 15°　Error of shift angle 20°　Error of shift angle degree 25°)/3

$$(0.001+0.002+0.004)/3=0.0023=0.002$$

Pitch error No.	PRM No.	Offset	Pitch error No.	PRM No.	Offset	Pitch error No.	PRM No.	Offset
1	208	0.000	9	216	+0.009	17	224	-0.013
2	209	+0.002	10	217	+0.006	18	225	-0.014
3	210	+0.005	11	218	+0.002	19	226	-0.014
4	211	+0.007	12	219	+0.001	20	227	-0.011
5	212	+0.009	13	220	0.000	21	228	-0.008
6	213	+0.013	14	221	-0.001	22	229	-0.006
7	214	+0.015	15	222	-0.005	23	230	-0.002
8	215	+0.012	16	223	-0.010	24	231	0.000

After compensating pitch error

KITAGAWA
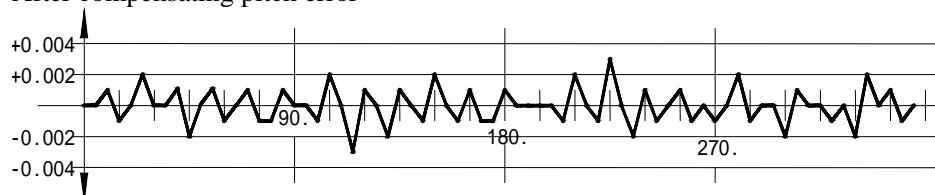
4   Expansion Channel

4.1   Structure

The channel of controller changes the number of channels optionally and variably and it can set maximum 90 channels.

Maximum 1000 blocks of 1 channel can be set. Thus, the programs that cannot be created can also be stored.

However, the program storable block capacity of the controller is 2000 blocks. Thus, it is necessary to set the number of blocks so that the program blocks inside of all channels are within a total 2000-block.

The following shows the channel and block structure when the expansion channel is used.

Standard setting (before shipping)
CH00   500 blocks   CH01   CH15   100 blocks

		CH00		
CH01	CH02	CH03	CH04	CH05
CH06	CH07	CH08	CH09	CH10
CH11	CH12	CH13	CH14	CH15

One measured volume shows 100 blocks.

Expansion example
CH00   CH09   50 blocks   CH10   CH13   250 blocks   CH14   CH23   50 blocks

CH00	CH01	CH02	CH03	CH04	CH05	CH06	CH07	CH08	CH09
		CH10					CH11		
		CH12					CH13		
CH14	CH15	CH16	CH17	CH18	CH19	CH20	CH21	CH22	CH23

One measured volume shows 50 blocks.

Expansion example
CH00   CH01   1000 blocks

		CH00		
		CH01		

One measured volume shows 100 blocks.

As shown above, since the block capacity can be freely divided if blocks are within 2000 blocks, the block capacity can be used maximum by setting the blocks according to the program capacity.

4.2.   Parameter setting

To use the expansion channel, it is necessary to set each parameter.

The parameter has the channel structure of expansion channel of use or change and program handling content, and block setting mode every channel.

**4.2.1.
Channel/block
structure spec.**

The channel/block structure specifications are set with   PRM390   .

PRM390 is selected from the following specifications.

0   CH00   500 blocks, CH01   CH15   100 block structure

1   When channel/block are optionally set, program check is performed.

2   When channel/block are optionally set, program check is not performed.

Precautions

1.   When the expansion channel is set, take care because old programs, etc., overflowed out of the channel are deleted. It is recommended to back up the programs before using the expansion channel.

**4.2.1.1.
PRM390=1**

When this setting is performed and the following case occurs,   Err.951   CH BLOCK SET ERROR   occurs.

➢   When blocks are reduced on newly setting, and existed blocks are more than a newly set value.

➢   When the newly set blocks exceed a total 2000-block.

When parameters on these conditions are stored and   Err.951   CH BLOCK SET ERROR   occurs, any block is not changed.

**4.2.1.2.
PRM390=2**

When this setting is performed and the following case occurs, the alarm is not displayed and the program is deleted.

➢   When the newly set program is less than the final program block, all blocks in the channel are deleted.

➢   When the newly set block is "0", its block is deleted together with the channel.

4.2.2.
Block setting

The channels in case the expansion channel is used and the blocks used with the channel are set with parameters.

Parameters are a total of 90 parameters of PRM400 PRM489. Each parameter corresponds to one by one of channels and the blocks used with its channel are set to the parameter.

To set parameters, the following conditions are required.

> The channel is to be used by a continuous number.
> The number of blocks is 1000.
> A total number of blocks is to 2000 blocks.

When these conditions are unsatisfied, a correct expansion channel is not set or any alarm occurs.

The comparison list for parameters and channels is as follows:

PRMNo.		CH No.	PRMNo.		CH No.	PRMNo.		CH No.
PRM400	⇔	CH00	PRM430	⇔	CH30	PRM460	⇔	CH60
PRM401	⇔	CH01	PRM431	⇔	CH31	PRM461	⇔	CH61
PRM402	⇔	CH02	PRM432	⇔	CH32	PRM462	⇔	CH62
PRM403	⇔	CH03	PRM433	⇔	CH33	PRM463	⇔	CH63
PRM404	⇔	CH04	PRM434	⇔	CH34	PRM464	⇔	CH64
PRM405	⇔	CH05	PRM435	⇔	CH35	PRM465	⇔	CH65
PRM406	⇔	CH06	PRM436	⇔	CH36	PRM466	⇔	CH66
PRM407	⇔	CH07	PRM437	⇔	CH37	PRM467	⇔	CH67
PRM408	⇔	CH08	PRM438	⇔	CH38	PRM468	⇔	CH68
PRM409	⇔	CH09	PRM439	⇔	CH39	PRM469	⇔	CH69
PRM410	⇔	CH10	PRM440	⇔	CH40	PRM470	⇔	CH70
PRM411	⇔	CH11	PRM441	⇔	CH41	PRM471	⇔	CH71
PRM412	⇔	CH12	PRM442	⇔	CH42	PRM472	⇔	CH72
PRM413	⇔	CH13	PRM443	⇔	CH43	PRM473	⇔	CH73
PRM414	⇔	CH14	PRM444	⇔	CH44	PRM474	⇔	CH74
PRM415	⇔	CH15	PRM445	⇔	CH45	PRM475	⇔	CH75
PRM416	⇔	CH16	PRM446	⇔	CH46	PRM476	⇔	CH76
PRM417	⇔	CH17	PRM447	⇔	CH47	PRM477	⇔	CH77
PRM418	⇔	CH18	PRM448	⇔	CH48	PRM478	⇔	CH78
PRM419	⇔	CH19	PRM449	⇔	CH49	PRM479	⇔	CH79
PRM420	⇔	CH20	PRM450	⇔	CH50	PRM480	⇔	CH80
PRM421	⇔	CH21	PRM451	⇔	CH51	PRM481	⇔	CH81
PRM422	⇔	CH22	PRM452	⇔	CH52	PRM482	⇔	CH82
PRM423	⇔	CH23	PRM453	⇔	CH53	PRM483	⇔	CH83
PRM424	⇔	CH24	PRM454	⇔	CH54	PRM484	⇔	CH84
PRM425	⇔	CH25	PRM455	⇔	CH55	PRM485	⇔	CH85
PRM426	⇔	CH26	PRM456	⇔	CH56	PRM486	⇔	CH86
PRM427	⇔	CH27	PRM457	⇔	CH57	PRM487	⇔	CH87
PRM428	⇔	CH28	PRM458	⇔	CH58	PRM488	⇔	CH88
PRM429	⇔	CH29	PRM459	⇔	CH59	PRM489	⇔	CH89

**4.2.2.1.
Parameter setting
examples**

Example   PRM400(CH00)=1000   PRM401(CH01)=500   PRM402(CH02)=300

CH00				
CH01				
CH02			Empty area	

One measured volume shows 100 blocks.

Example   PRM400(CH00)   PRM489(CH89)=20

00	01	02	...														...	22	23	24
25	26	27	...														...	47	48	49
50	51	52	...														...	72	73	74
75	76	77	...				...	85	86	87	88	89	Empty area						

One measured volume shows 20 blocks.

Example   PRM400(CH00)   PRM401(CH01)=500   PRM402=0   PRM403=1000

CH00				
CH01				
		Empty area		

One measured volume shows 100 blocks.

 This setting is performed, all blocks after setting PRM402=0 become invalid.

Example   PRM400(CH00)   PRM401(CH01)=1000   PRM402=1
When pushing **INPUT** ," Err.951   CH BLOCK SET ERROR"   occurs.

Example   PRM400(CH00)=1000   PRM401(CH01)=1001
After inputting PRM401,   After pushing **ENT**   " Err.950   PRM RANGE
OVER"   occurs.

5   External Channel Selection

The program channel of controller can be selected by external input mode.

This external channel selecting methods are as follows:

  ➢ Binary mode   (CH00   max. CH15)

  ➢ M-signal mode   CH00   max. CH89

External channels can be changed when STATUS is STOP or RESET mode.

5.1   Binary mode

Binary is a binary number.

Each input signal is allocated to the digit of binary number and the program channel is selected by its combination.

When selecting the external channel by the binary, even if the expansion channel is set, only CH00 max. CH15 can be selected. (The channels of CH16 or more cannot be selected.)

5.1.1.
Parameter setting   When the external channel is selected with the binary mode, set parameters as shown below.

  PRM033=0   External channel is selected by binary mode.

  PRM112=1   External channel is selected.

5.1.2.
External I/O signals   I/O signals relative to external channel selection of binary mode are as follows:

Input signals to show channel Nos.

  ➢ CHSEL0   Binary signal ^{0} B0

  ➢ CHSEL1   Binary signal ^{1} B1

  ➢ CHSEL2   Binary signal ^{2} B2

  ➢ CHSEL3   Binary signal ^{3} B3

INPUT signal changed to content selected with channel No.

  ➢ CHSET   Channel Set

OUTPUT signal to show a channel No. change finish.

  ➢ BLKFIN   Block finish signal

**5.1.3.
Binary list**

CH NO.	B3 8	B2 4	B1 2	B0 1
00				
01				
02				
03				
04				
05				

CH NO.	B3 8	B2 4	B1 2	B0 1
06				
07				
08				
09				
10				
11				

CH NO.	B3 8	B2 4	B1 2	B0 1
12				
13				
14				
15				

Mark   shows INPUT state (ON).

**5.1.4.
Timing**
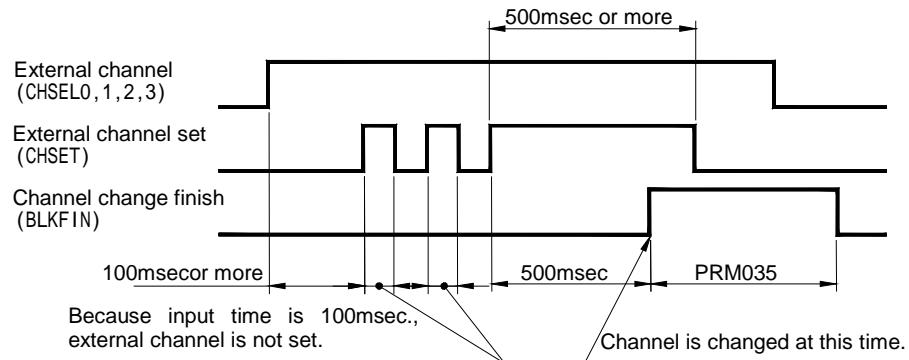
External channel select INPUT signal is to be continuous 100msec., or more by considering the chattering.

External channel INPUT signal is to be continuous 500msec., or more by considering the chattering.

After inputting CHSET signal, FIN OUTPUT is to be started at 500msec.

BLK FIN OUTPUT time is to be time of PRM035.

Precautions

1. Channel does not change even if CHSET INPUT is turned ON, during BLKFIN and G99FIN OUTPUT.
2. When INPUT time of CHSET is 500msec or less, the channel does not change.
3. The timing to change the channel is after 500msec., from CHSEL INPUT start.

5.2.   M-signal mode

Each INPUT signal adds the value one by one, adds/subtracts the value 10 by 10 and clears the value to 00. The program channel can be selected by their combination.

When the external channel is selected by the M-signal mode, CH00 max. CH89 for the extension channel setting can be selected.

5.2.1.
Parameter setting

When the external channel is selected by M-signal mode, set the parameter as shown below:

PRM033=1   External channel is selected by M-signal mode.

PRM112=1   External channel is selected.

5.2.2.
External I/O signals

I/O signals relative to the external channel selection of M-signal mode are as follows:

Input signals to show the channel No.

➢ CHSEL0   ZERO Signal

Channel No. cleared to 0.

➢ CHSEL1   PLUS1 Signal

Channel No. added one by one.

➢ CHSEL2   PLUS10

Channel No. added ten by ten.

➢ CHSEL3   MINUS10

Channel No. subtracted ten by ten.

OUTPUT signal to show channel No. change finish.

➢ BLKFIN   Block finish signal

**5.2.3.
Timing**


```
                              100msec            100msec or more
ZERO
(CHSEL0)

PLUS1
(CHSEL1)

PLUS10
(CHSEL2)

MINUS10
(CHSEL3)

Channel
change finish
(BLKFIN)

                          Channel is changed at
                          this point.
CHOUT0

CHOUT1

CHOUT2

CHOUT3

CHOUT4

CHOUT5

CHOUT6

          CH00   CH10   CH20   CH30   CH31   CH32   CH22
```
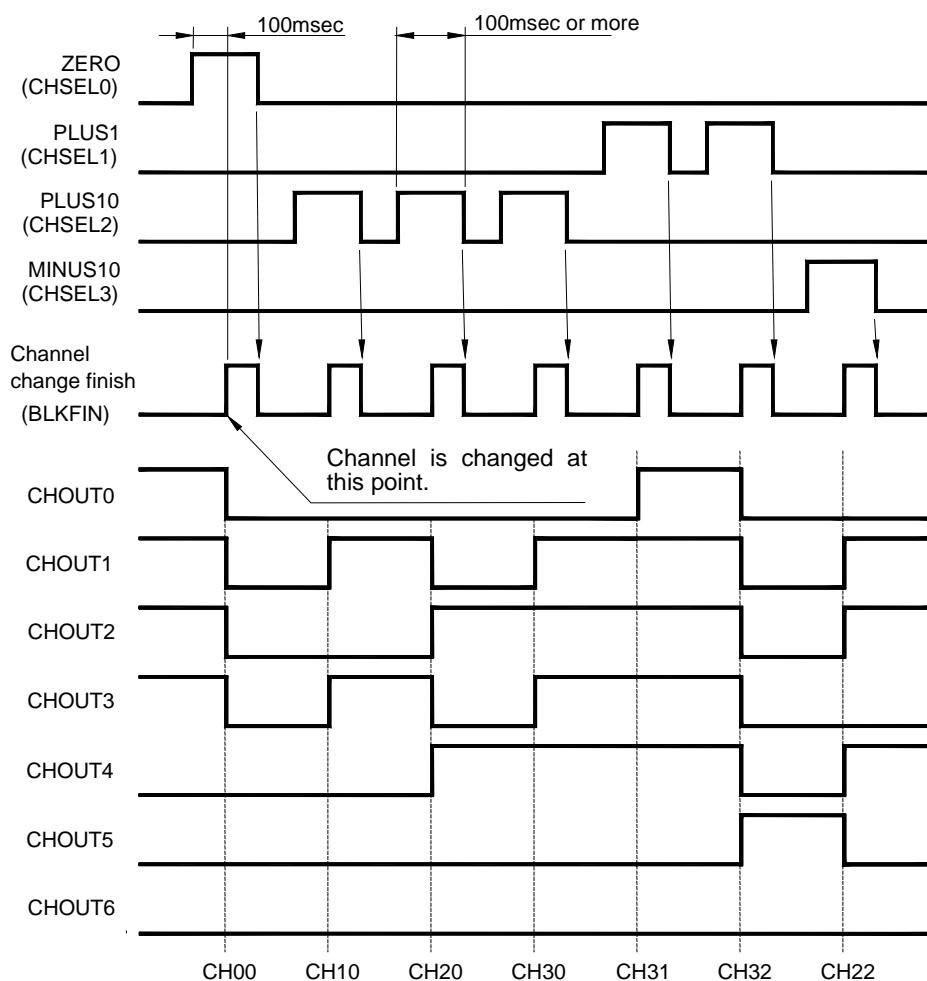
An external channel select INPUT signal is to be continuous 100msec., or more by considering the chattering.

After inputting the external channel selection, FIN OUTPUT is to be started at 100msec.

Since a BLK FIN OUTPUT is turned OFF after checking the channel selection INPUT OFF, the time of PRM035 is not outputted.

Precautions

Channel does not change even if the external channel selection INPUT is ON during BLKFIN and G99FIN OUTPUT.

The channel does not change even if other channel is inputted during external channel selection input.

When the interval of 100msec or more is not checked after external channel selection OFF, the channel is not changed.

The timing to change the channel is after 100msec., from EXCHSEL INPUT start.

6.   Over Travel

When an OVER TRAVEL signal 1 or 2　OVRUN1, OVRUN2　detects an OVER TRAVEL state, an alarm No. 031 or 032 lights and this mode stops the control axis in emergency and immediately. The OVER TRAVEL is detected by a serial detecting method.

  ➢ Parallel detecting method (Standard)
  ➢ Serial detecting method

6.1.   Parallel detecting method

OVRUN1 of over travel signal on　　side and OVRUN2 on　　side detect OVER TRAVEL (OT) individually. When OT is detected,　　side or　　side is checked by an input signal content.

As a result, during OT detection, error occurs even if a RESET button is pushed unless OT is released.

6.1.1.
Parameter setting   When the OVER TRAVEL is detected, parameters are set as follows:

     PRM121=0   Serial detecting method

     PRM206=1   Contact spec. of OVRUN is to be B-contact.

6.1.2.
OT Detection   When OVER TRAVEL 1 is detected during operation,　　Err.031　OVER TRAVEL　　occurs and the machine stops in emergency by the dynamic brake.

When OVER TRAVEL 2 is detected,　　Err.032　OVER TRAVEL　　occurs and the machine stops in emergency by the dynamic brake similarly.

In case of parallel detecting method, the alarm is determined by detected INPUT signals (OVRUN1　OVRUN2　regardless of operational direction in over travel detection.
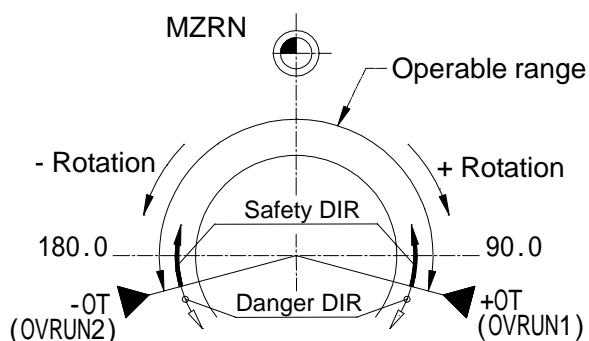
6.1.3
To release OVER TRAVEL

The safety direction when　　Err.031　OVER TRAVEL　　occurs is usual "
side" and the releasing method to the safety direction is as follows.

However, the table does not shift in "　　" direction even if $\boxed{\textbf{INS}}$ is pushed.

Set the mode to MANUAL.

Shift the table in "　direction" with $\boxed{\textbf{DEL}}$ of JOG key.

When JOG operation is performed, pushing $\boxed{\textbf{HI}}$, the table rotates at rapid traverse.

The safety direction when　　Err.032　OVER TRAVEL　　occurs is usual "
side" and the releasing method to the safety direction is as follows.

However, the table does not shift in "　　" direction even if $\boxed{\textbf{DEL}}$ is pushed.

Set the mode to MANUAL.

Shift the table in "　direction" with $\boxed{\textbf{INS}}$ of JOG key.

When JOG operation is performed, pushing $\boxed{\textbf{HI}}$, the table rotates at rapid traverse.

6.1.4.
Forcedly shifting method

When　　Err.031　OVER TRAVEL　　occurs, the forced shift in + direction is as follows:

Set the mode to MANUAL.

When pushing $\boxed{\textbf{INS}}$ with $\boxed{\textbf{OVR}}$ pushed, the table shifts in "
direction" of danger direction.

The forced shift of　　Err.032　OVER TRAVEL　　is as follows:

Set the mode to MANUAL.

When pushing $\boxed{\textbf{DEL}}$ with $\boxed{\textbf{OVR}}$ pushed, the table shifts in "
direction" of danger direction.

The feedrate when the forced shift is performed is fixed at 0.5min^{-1}.

Precautions

1. Do not use this forced shift mode usually. Because this forced shift is performed in a danger direction, when performing the operation unavoidably, check that the table does not interfere or collide with any obstruction.

6.2   Serial detecting method

The plus ( ) side and minus ( ) side of OVER TRAVEL (OT) are determined by an operational direction in OT detecting with OVRUN1 of over travel signal.

For this reason, when resetting after detecting the alarm, the alarm is released once and the alarm occurs again in next operation.

6.2.1.
Parameter setting   When the OVER TRAVEL is detected, parameters are set as follows:

PRM121=1   Serial detecting method

PRM206=1   Contact spec. of OVRUN is to be B-contact.

6.2.2.
OT Detecting   During OVER TRAVEL 1 detecting, when the table rotates in   direction or has already been rotated, the alarm of   Err.031   OVER TRAVEL   occurs and the table is stopped immediately by the dynamic brake.

During OVER TRAVEL 1 detecting, when the table rotates in   direction or has already been rotated, the alarm of   Err.031   OVER TRAVEL   occurs. Similarly, the table is stopped immediately by the dynamic brake.

If power is turned OFF during OT detecting," Err.031" or" Err.032" is determined by a first actuation. T

When pushing │ **DEL** │ during OT detecting at   side,   Err.032   OVER TRAVEL   occurs in reverse as usual travel. When pushing │ **INS** │ during OT detecting at   side,   Err.031   OVER TRAVEL   occurs in reverse as usual travel. Therefore, release the over travel carefully.

MZRN

Rotation   Rotation

Safety DIR

270. C   90. 0

- OT   +OT
(OVRUN1−2)   (OVRUN1- 1)

Danger DIR

Connect OVRN1-1, 1-2 to SRL
and input them in OVRUN1.
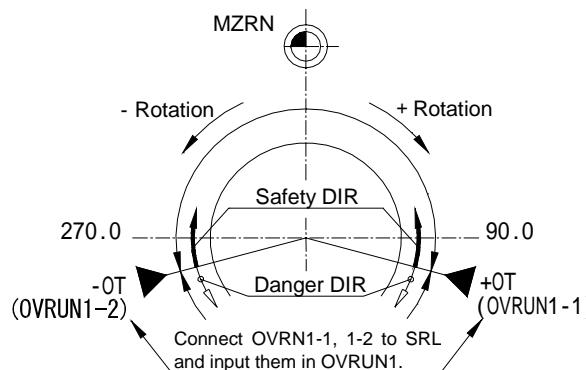
In motion   in figure,
    Err.031 OVER TRAVEL
occurs.
In motion   in figure,
    Err.032 OVER TRAVEL
occurs.

6.2.3.
To release OVER TRAVEL

The safety avoidance direction when   Err.031   OVER TRAVEL   occurs is usual "   side" and the releasing method to the safety avoidance direction is as follows.

However, the table does not shift in "   "   direction even if &boxed;INS&boxed; pushed.

> Push [RESET] button to reset Err.031.
>
> Set the mode to MANUAL.
>
> Shift the table in "   direction" with &boxed;DEL&boxed; of JOG key.
>
> When JOG operation is performed, pushing &boxed;HI&boxed;, the table rotates at rapid traverse.

The safety avoidance direction when   Err.032   OVER TRAVEL   occurs is usual "   side" and the releasing method to the safety avoidance direction is as follows.

However, the table does not shift in "   "   direction even if &boxed;DEL&boxed; pushed.

> Push &boxed;RESET&boxed; button to reset Err.032.
>
> Set the mode to MANUAL.
>
> Shift the table in "   direction" with &boxed;INS&boxed; of JOG key.

When JOG operation is performed, pushing &boxed;HI&boxed;, the table rotates at rapid traverse.

6.2.4.
Forcedly shifting method

When   Err.031   OVER TRAVEL   occurs, the forced shift in   direction is as follows:

> Push &boxed;RESET&boxed; to reset Err.031.
>
> Set the mode to MANUAL.
>
> When pushing &boxed;INS&boxed; with &boxed;OVR&boxed; pushed, the table shifts in "   direction" of danger direction.

The forced shift of   Err.032   OVER TRAVEL   is as follows:

> Push &boxed;RESET&boxed; to reset Err.032.
>
> Set the mode to MANUAL.
>
> When pushing &boxed;DEL&boxed; with &boxed;OVR&boxed; pushed, the table shifts in "   direction" of danger direction.

The feedrate when the forced shift is performed is fixed at 0.5min^{-1}.

Precautions

> 1. Do not use this forced shift mode usually.
>   Because this forced shift is performed in a danger direction, when performing the operation unavoidably, check that the table does not interfere or collide with any obstruction.

7.　　Data Communication

7.1.　　Data communication

Controller handles program data, parameter data, and WZERO position data.
To enable the management of these data, the controller is equipped to communicate with external equipment.

There are following two types of data communication.

➢　Data communication by controller function
The communication function of the controller enables "Program", and "Parameter" to communicate with external equipment.
This function however communicates programs by channel, and do not handle WZERO position data communication.

➢　Data communication by private communication software: "UPDOWNLOAD"
This private communication software enables to communicate "Programs", "Parameters", and "WZERO position" to external equipment.
The functions of this software are as follows:

- Batch communication of programs
- Communication every channel in programs
- Parameter communication
- WZERO position communication
- Batch communication of all data (programs, parameters, and WZERO position)

This private communication software enables to communicate data without various operations on the controllers.

For an exclusive communication software, refer to　　Explanation for Exclusive Communication Software　　.

∎　KITAGAWA can offer the exclusive communication software optionally.

7.2.   Program data communication using controller functions

This section explains the procedures for program input/output communications, with external equipment, using the communication functions in the controller.

7.2.1
Program input

This is to write a program from external equipment into a selected channel.

| MODE | ➔ | Push **MODE** to select "EDIT". |

Oᴄʜ ** ENT Oᴄʜ   ➔ Call out a desired channel to input a program. (Only a channel number is displayed on the upper left of a screen.)

INS ➔ A screen to display the program INPUT mode appears.

CH05 IN PRG

(Example: CH05 program input mode)

ENT ➔ Clear the program existing in the specified channel, by key-in: "CH** PRG DEL" is displayed.
Then, the screen to display a standby program INPUT mode is displayed.

CH05 IN 000

(Example: CH05 standby program input)

Data transmission from external equipment ➔ Program input ends when the block numbers are counted up from "000" to the last block number.   The end is displayed on the screen.

CH05 IN END

(Example: CH05 program input ended)

Input the program to be transmitted in accordance with the data format explained in the later section of this instruction manual.

The indicating display remains until next key-in is performed.

Precautions

> 1.   Previous program is lost at the beginning of program forwarding. Save program data backup before input operation.

7.2.2.
Interruption during program input

This is to stop program input in process.

[CAN]

➜ Program input is interrupted, and the display goes back to original EDIT screen.

```
CH05 /A/G90A90.000
N000 F0     D    J
```
(Example: EDIT screen for CH05)

The program forwarded is stored before the interruption.

Previous program is cleared at the beginning of program forwarding.

7.2.3.
Program output

This is to output a program in a selected channel to an external equipment.

External equipment standby for download

➜ Prepare the external equipment ready to receive transmitted data.

[MODE]

➜ Push [**MODE**] to select "EDIT".

[O_CH] **   [ENT] [O_CH]

➜ Call out a desired channel to transmit the program to. (Only a channel number is displayed on the upper left of a screen.)

[DEL]

➜ The screen to display the program output mode is displayed.

```
CH05 OUT PRG
```
(Example: CH05 program output mode)

[ENT]

➜ With the key-in, program output in the channel is executed, and the number of block being output is displayed as "CH** out 000".

The completion of program output is displayed on the screen.

```
CH05 OUT END
```
(Example: CH05 program output ended)

7.2.4.
Interruption during program output

This is to stop program output in process.

[CAN]

➜ By pushing this key, program output is interrupted, and the display is put back to EDIT screen.

The programs forwarded to external equipment before the interruption are outputted.

7.3.   Communicating parameter data using controller

This section explains the procedures for parameter input/output communications, with external equipment, using the communication function equipped on the controller.

7.3.1.
Parameter input   This is to write parameters from an external equipment.

Emergency stop state   ➔ Push emergency stop button, or input external emergency stop command to bring emergency stop state.

[MODE]   ➔ Push **MODE** to select "PARAM".

[ENT] [9] [9] [9]   ➔ Set "999" to PRM110 to bring all parameter rewritable state.
[ENT]

[LNS]   ➔ The status is displayed being parameter input mode.

PARAMETER IN

(Parameter input mode)

[ENT]   ➔ The display shows the state being in the parameter download standby state.

PRMIN 000

(Parameter input standby)

Data transmission from   ➔ When the parameter numbers are counted up external equipment   from "000" to the last number, the parameter input ends, and the display prompts to turn the power off.

PRMIN END
POWER OFF

(Parameter input ended)

Input the program to transmit according to the data format explained in the later section of this instruction manual.

Key in **INPUT** after parameter input is not necessary.

Precautions

1. Previous parameters are overwritten at the beginning of parameter forwarding.   Save parameter data backup before input operation.
2. After rewriting the parameters, turn off the power and reboot.

**7.3.2.
Interruption during
parameter input**

This is to stop parameter input in process.

[CAN] → Parameter input is interrupted, and stops with contents and number at the time of interruption displayed.

> ## PRMIN 123

(Example: Interrupted at PRM123 being input)

The parameters forwarded before the interruption are replaced.

Even in case of Interruption, "Err.091 POWER OFF PRM" is displayed, therefore, proceed with power off operation.

Inputting **INPUT** after parameter input is unnecessary.

The display indicating the interruption of input remains until any key other than **CAN** is pushed

**7.3.3.
Parameter output**

This is to write parameter from external equipment.

External equipment standby for data download

→ Prepare the external equipment standby for communication data download.

[MODE] → Push **MODE** to select "PARAM".

[DEL] → On the screen, the state being in the parameter output mode is indicated.

> ## PARAMETER IN

(Parameter output mode)

[ENT] → When parameter output is started and parameter numbers are counted up to the last number, then parameter output end is diplayed on the screen.

> ## PRMOUT END

(Parameter output ended)

**7.3.4.
Interruption during
parameter output**

This is to stop parameter output in process.

[CAN] → By pushing this key, parameter output is interrupted, and the display is put back to PRM110 screen.

The parameters forwarded to the external equipment before the interruption are output.

7.4.   Communication data format

This section shows data formats for data transmission using the communicating function of the controller.

7.4.1.
Program data   The program data format is as follows.

% ¹	CRLF	CH01	CRLF	N000G90A90F0	CRLF

N001A−0F500	CRLF		N099G23J0	CRLF	% ²
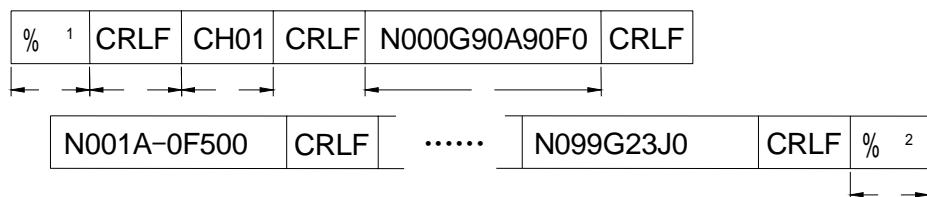
   ① **%**   Code to denote the data begin here
   ② CRLF   Linefeed code
   ③ CH01   Channel data
   ④ N000G90···   Program data
   ⑤ **%**   Code to denote the data end here

7.4.2.
Parameter data   The parameter data format is as follows.

% ¹	CRLF	P000A010B010	CRLF

P001A0B0	CRLF		P580A0B0	CRLF	% ²
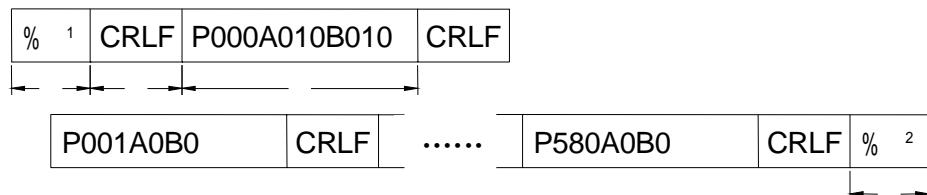
   ① **%**   Code to denote the data begin here
   ② CRLF   Linefeed code
   ③ P000A01···   Parameter data
   ④ **%**   Code to denote the data end here

MAINTENANCE MANUAL

■   Readers for This Manual

Readers for this manual are as follows:

➢   Persons who adjust trial run or servo adjustment

➢   Persons who adjust parameters

➢   Persons who perform maintenance work

C o n t e n t s

1   Alarms

1.1   Kinds of alarms

Alarms are classified in different ranks. Each rank has different operation programs and different halt conditions.

Alarm Rank	C o n t e n t
0	Alarm rank 0 is an extremely high emergency alarm. When Alarm 0 is indicated, the servo stops right away and operation also stops. When turning on the power switch, internal check is performed. If the result is not satisfactory, alarm occurs. When this alarm is indicated, servo is not turned ON. Reset or turn on the power switch after an adjustment is made. If everything goes normal, then alarm will not occur.
2	This alarm occurs during the program execution. When this alarm is indicated, the circular table and the program stop. Servo does not stop.
8	This alarm occurs when a failure happens during data communications or execution of remote control. If this alarm occurs, communication is terminated. In case of the remote control, program will not be executed.
9	The alarm occurs when the program content, program area or program data is incorrect.
No Rank	When alarm occurs regarding the servo, the same error number as the servo pack is indicated regardless of the alarm rank.

An alarm is displayed in three digits consisting of numeric and the alphabet characters.

The first digit indicates the alarm rank, and the following two digits indicate the kind of the alarm.
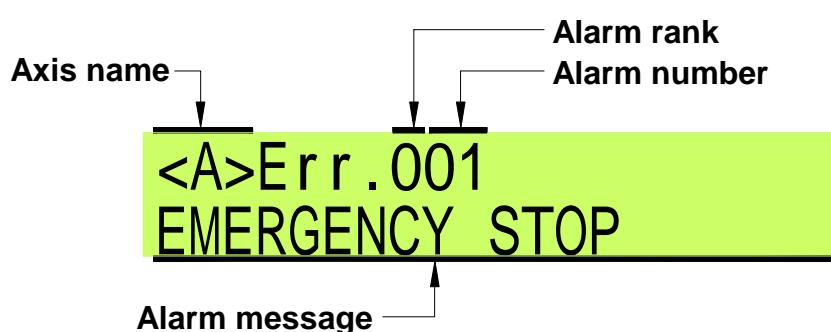
1.2.   Alarm list

1.2.1.
Alarm rank 0

Alarm No.	Alarm Content / Alarm Message	Release	Page
001	Emergency stop / EMERGENCY STOP	RESET	I1-10
002	External emergency stop / EXT EMERGENCY SP	RESET	I1-10
003	Abnormal temperature in controller / ABNORMAL TEMP	RESET	I1-10
008	Watch dog time out / WATCHDOG	Power OFF	I1-10
016	Brake failure / BRAKE FAILURE	RESET	I1-28
019	Positioning deviation over in braking / POS-DEV OVER CL	Power OFF	I1-11
020	Brake clamp positioning deviation waiting / POS-DEV WAIT CL	RESET	I1-11
021	ST signal alarm / ST SIGNAL ALARM	RESET	I1-11
023	SP signal alarm / SP SIGNAL ALARM	RESET	I1-11
024	ZERO pulse waiting / ZERO-PULS WAIT	RESET	I1-11
031	Over travel / OVER TRAVEL+	RESET	I1-12
032	Over travel / OVER TRAVEL-	RESET	I1-12
080	EEPROM writing error / EEPROM WRITE ERR	RESET	I1-12
082	EEPROM clear error / EEPROM CLEAR ERR	RESET	I1-12
083	EEPROM address G, CH writing error / EEPROM G/CH ERR	RESET	I1-13
084	EEPROM address J writing error / EEPROM J ERR	RESET	I1-13
085	EEPROM address P/F writing error / EEPROM P/F ERR	RESET	I1-13
086	EEPROM address D/E writing error / EEPROM D/E ERR	RESET	I1-13
087	EEPROM address A/L writing error / EEPROM A/L ERR	RESET	I1-13
089	EEPROM check error / EEPROM CHECK ERR	Power OFF	I1-13

Alarm No.	Alarm Content	Release	Page
	Alarm Message		
090	NC pulse CPU connection time out	RESET	I1-13
	NC PLS CPU TIMOUT		
091	Power OFF alarm	Power OFF	I1-13
	POWER OFF ALARM		
092	Power ON error	Power OFF	I1-14
	POWER ON ERROR		

1.2.2.
Alarm rank 2

Alarm No.	Alarm Content / Alarm Message	Release	Page
200	External ZRN input WZERO specification error ZRN WZERO ERROR	RESET	I1-14
201	WZRN alarm WORK ZRN ALARM	RESET	I1-14
202	Stack underflow STACK UNDERFLOW	RESET	I1-14
203	Stack overflow STACK OVERFLOW	RESET	I1-14
204	Not return alarm NOT RETURN ALARM	RESET	I1-14
205	Positioning time over POS TIME OVER	RESET	I1-14
207	Divide command (DIV) error DIVIDE CMD ERROR	RESET	I1-15
208	G27 data 0 error G27 DATA0 ERROR	RESET	I1-15
209	G27 P>E Error G27 P>E ERROR	RESET	I1-15
210	F data error F DATA ERROR	RESET	I1-15
213	Software limit SOFTWARE LIMIT+	RESET	I1-15
214	Software limit SOFTWARE LIMIT-	RESET	I1-15
215	Zero return alarm MZRN INPUT ERROR	RESET	I1-15
216	Angle error in absolute command ANGLE ERROR IN ABS	RESET	I1-15
217	G99FIN time out G99FIN TIME-OUT	RESET	I1-16
218	Channel set alarm CHANNEL SET ALARM	RESET	I1-16
219	External mode selection error EXT MODE SEL ERROR	RESET	I1-16
230	G09 execution axis error ILLEGAL G09	RESET	I1-16

1.2.3.
Alarm rank

Alarm No.	Alarm Content / Alarm Message	Release	Page
800	Address error / NC ADDRESS ERROR	RESET	I1-16
801	NC axis command error / NC AXIS ERROR	RESET	I1-16
803	NC set range error / NC SET RANGEOVER	RESET	I1-16
804	NC channel number error / NC CHANNEL ERROR	RESET	I1-17
805	NC block number error / NC BLOCK NO. ERROR	RESET	I1-17
808	NC command error / NC COMMAND ERROR	RESET	I1-17
820	RS232C Hardware alarm / RS232C H/W ALARM	RESET	I1-17
826	Flaming alarm / FLAMING ALARM	RESET	I1-17
827	Parity alarm / PARITY ALARM	RESET	I1-17
851	Illegal command alarm / ILLEGAL CMD ALARM	RESET	I1-17
852	No command alarm / NO COMMAND ALARM	RESET	I1-17
853	Illegal G-code, address alarm / ILLEGAL G/ADD	RESET	I1-17
854	Over-run alarm / OVER-RUN ALARM	RESET	I1-18
855	Command receiving disable mode / CMD ILLEGAL MODE	RESET	I1-18

1.2.4.
Alarm rank

Alarm No.	Alarm Content / Alarm Message	Release	Page
901	EEPROM Program area error EEPROM PROG ERROR	RESET	I1-18
911	Parameter input error PRM INPUT ERROR	RESET	I1-18
930	Program channel number input error PROG CH ERROR	RESET	I1-18
931	Block number input error PROG BLOCK ERROR	RESET	I1-18
940	Program G-code input error PROG G ERROR	RESET	I1-18
941	Program J-address input error PROG J ERROR	RESET	I1-19
942	Program F-address input error PROG F ERROR	RESET	I1-19
943	Program P-address input error PROG P ERROR	RESET	I1-19
944	Program A -address input error PROG A ERROR	RESET	I1-19
945	Program L -address input error PROG L ERROR	RESET	I1-19
946	Program D-address input error PROG D ERROR	RESET	I1-19
947	Program E-address input error PROG E ERROR	RESET	I1-19
950	Parameter range over PRM RANGE OVER	RESET	I1-19
951	CH block variable change error CH BLOCK SET ERROR	RESET	I1-19
952	Block set error BLOCK SET ERROR	RESET	I1-19
961	EDIT Block copy error BLOCK INS ERROR	RESET	I1-19
962	EDIT Illegal G-code EDIT ILLEGAL G	RESET	I1-20

1.2.5.
Servo alarm

Alarm No.	Alarm Content / Alarm Message	Release	Page
020	Parameter destruction / PRM DESTRUCT	Released by servo.	I1-21
030	Main circuit detection error / MC PDE ERROR	Released by servo.	I1-21
040	Parameter setup error / PRM SETUP ERROR	Released by servo.	I1-21
041	Dividing pulse output set error / PG PLS SET ERROR	Released by servo.	I1-21
050	Combination error / COMBINATION ERROR	Released by servo.	I1-21
100	Over current or overheat of heat sink / OVER CURRENT	Released by servo.	I1-21
300	Regenerative error / REGENERATIVE ERROR	Released by servo.	I1-21
320	Regenerative overload / REGENERATIVE OL	Released by servo.	I1-22
330	Main circuit power source wiring error / MAIN CIRCUIT ERR	Released by servo.	I1-22
400	Over voltage / OVER VOLTAGE	Released by servo.	I1-22
410	Under voltage / UNDER VOLTAGE	Released by servo.	I1-22
510	Over speed / OVER SPEED	Released by servo.	I1-22
511	Dividing pulse output speed / PLS OUT SPEED	Released by servo.	I1-22
520	Vibration alarm / VIBRATION ALARM	Released by servo.	I1-23
710	Over load (Momentary maximum load) / OL(FLASHMAX)	Released by servo.	I1-23
720	Over load (Continuous maximum load) / OL(RATINGMAX)	Released by servo.	I1-23
730	DB Over load / DB OVERLOAD	Released by servo.	I1-23
740	Inrush current limit resistance overload / INRUSHRESOL	Released by servo.	I1-23
7A0	Heat sink overheat / HEATSINK HEATING	Released by servo.	I1-23
810	Encoder backup alarm / ENC BACKUP ALARM	Released by servo.	I1-24
820	Encoder same check alarm / ENC SAMECHK ALARM	Released by servo.	I1-24

Alarm No.	Alarm Content / Alarm Message	Release	Page
830	Encoder battery alarm ENC BATTERY ALARM	Released by servo.	I1-24
840	Encoder data alarm ENC DATA ALARM	Released by servo.	I1-24
850	Encoder over speed ENC OVER SPEED	Released by servo.	I1-24
860	Encoder overheat ENC OVER HEAT	Released by servo.	I1-25
B10	Speed command A/D error V-REF A/D ERROR	Released by servo.	I1-25
B20	Torque command A/D error T-REF A/D ERROR	Released by servo.	I1-25
B31	Current detection alarm 1 CURRENT DET ALM1	Released by servo.	I1-25
B32	Current detection alarm 2 CURRENT DET ALM2	Released by servo.	I1-25
B33	Current detection alarm 3 CURRENT DET ALM3	Released by servo.	I1-25
BF0	System alarm SYSTEM ALARM0	Released by servo.	I1-25
BF1	System alarm SYSTEM ALARM1	Released by servo.	I1-25
BF2	System alarm SYSTEM ALARM2	Released by servo.	I1-25
BF3	System alarm SYSTEM ALARM3	Released by servo.	I1-25
BF4	System alarm SYSTEM ALARM4	Released by servo.	I1-25
C10	Burn-up check detection BURN-UP CHKDET	Released by servo.	I1-25
C80	Encoder clear error ENC CLEAR ERROR	Released by servo.	I1-26
C90	Encoder communication error ENC COMMUNI ERROR	Released by servo.	I1-26
C91	Encoder communication position data acceleration error ENC COM POS ERROR	Released by servo.	I1-26
C92	Encoder communication timer error ENC COM TIME ERROR	Released by servo.	I1-26
CA0	Encoder parameter error ENC PRM ERROR	Released by servo.	I1-26
CB0	Encoder echo back error ENC ECHOBACK ERROR	Released by servo.	I1-26
CC0	Multi-limit mis-compare MULT LM MISCOMPARE	Released by servo.	I1-26

Alarm No.	Alarm Content	Release	Page
	Alarm Message		
D00	Positioning deviation Over	Released by servo.	I1-27
	POS-DEV OVER		
D01	Servo OFF positioning deviation over	Released by servo.	I1-27
	SV OFF POS-DEV OVER		
D02	Servo ON positioning deviation over	Released by servo.	I1-27
	SV ON POS-DEV OVER		
F10	Power line open-phase	Released by servo.	I1-27
	PSUNACTIVATED		
F20	Motor cable disconnection	Released by servo.	I1-27
	MOTOR DISCONNECTION		
CPU00	Main CPU communication error	Released by servo.	I1-27
	MAIN COMMUNI ERROR		
400	Machine zero position unset	Released by servo.	I1-27
	MZERO POS UN-SETUP		

Though there is a case that the servo alarm is the same as other alarm No., this trouble occurs because of the alarm numbers that occur by the controller and the servo amplifier. In this case, check the alarm conditions by the alarm message contents.

1.3. Alarm causes and countermeasures

Err. No..	Description of alarm / Cause	Details / Countermeasures
001	**Emergency stop**	Emergency stop input is checked.
	1. Emergency stop button on the panel is pushed. If alarm occurs when emergency stop button is not pushed, the causes are as shown below. 2. The contact point of the emergency stop button is broken. 3. The emergency stop cable in the controller is broken.	1. Check the safety around the area and release the emergency stop. Turn the emergency stop button clockwise to release it. 2. Replace the emergency stop button. 3. Replace the cable.
002	**External emergency stop**	Emergency stop is inputted from outside.
	1. Emergency stop is inputted from outside. 2. CB3 cable is broken. 3. The contact point for the external output on the other machine is opened (operational defect).	1. Check the safety around the area and release the external emergency stop. 2. Replace the CB3 cable. 3. Refer to the manufacturer of the machine.
003	**Abnormal temperature in controller**	The surface temperature of the main board exceeds 60 .
	1. The ambient temperature exceeds 45 . 2. Cooling fan stops because of clogging. 3. Exposed to direct sunlight. 4. Te main board is heated remarkably. 5. Temperature sensor fails.	1. Shift the controller to well-ventilated location. 2. Replace the cooling fan. Clean or replace the filter. 3. Shut the sunlight or shift the controller in the shade. 4-1. Lower the feedrate. 4-2. Increase the constant during acceleration. 5. Replace the controller of the main board.
008	**Watch dog time out.**	The watch dog circuit triggers to check CPU's normal operation.
	1. Noise 2. Thunder	Turn ON the power. If the alarm occurs frequently, The internal circuit may be damaged. Contact with Kitagawa's Serviceman or your agent. Replace the controller with a new one..
016	**Brake failure**	The brake is damaged.
	See the detailed alarm clause for Err.016	

Err. No.	Description of alarm	Details
	Cause	Countermeasures
019	Droop over in braking	The motor starts rotation by an external force during clamping, exceeding the set value.
	1. Air pressure is low. 2. Heavy cutting is performed. 3. The set value of the parameter is small. 4. Overshooting occurs because the inertia of jig, etc., is large.	1. Raise the air pressure. 2-1. Lower the cutting speed of the machine. 2-2. Reduce the amount of cutting. 3. Raise the set value of PRM015. 4-1. Servo adjustment. 4-2. Lower the feedrate.
020	Brake clamp droop waiting	The parameter does not become less than set value even if 5 seconds elapses after the distribution is finished.
	1. Overload. 2. The set value of the parameter is small.	1. Reduce the load. 2. Make the set value for PRM015 higher.
021	ST Signal alarm	ST signal is not turned off when more than 5 seconds passed since the power gets ON.
	1. Start input is kept ON at external equipment. 2. ST and INCOM are short- circuited.	1. Release the status that keeps the starting input. 2. Replace the cable CB3 if the cable is incorrect.
023	SP Signal alarm	SP signal is not turned ON when more than 5 seconds passed since the power gets ON.
	1. Stop input is kept ON at external equipment. 2. SP cable is broken.	1. Release the status that keeps the stop input. 2. Replace the cable CB3.
024	ZERO pulse waiting	Zero pulse is not checked in MZRN even if the table rotates by the constant angular.
	1. The acceleration constant is small. 2. CB1cable is broken. 3. Motor encoder is incorrect.	1. Raise the acceleration constant. 2. Replace CB1 cable. 3. Replace the motor.

Err. No.	Description of alarm	Details
	Cause	Countermeasures
031	Over travel	Hard limit + side is detected.
032	Over travel	Hard limit - side is detected.
	1. Over travel is detected. The machine is positioned at Though machine is not in OT position, when alarm occurs, the following problems are considered.	1-1. Release the over travel with the following procedure when an alarm is detected during table rotation. After reset, set mode to MANUAL. In case of Err.031, push | DEL | key to shift table to the location where over travel is released. In case of Err.032, use | INS | key for the same procedure. In case of Err.031 032, in order to avoid collision, single use of | DEL | or | INS |key can not rotate table to the direction of the collision. 1-2. When shifting table in direction other than escape direction even if alarm is detected, release OT according to the following procedure. After resetting and set mode to MANUAL. In case of Err.031, push | OVR | + | DEL | keys to rotate the table to the location where over travel is released. In case of Err.032, use | OVR | + | INS | keys for the same procedure. <u>Because the table is rotated forcedly by pushing OVR key, take extreme care to release OT.</u> For safety reasons, rotation speed is set at 0.5min^{-1} in the collision direction.
	2. The detect switch for over travel is out of order.	2. Replace the over travel detecting switch.
	3. The cable for over travel is incorrect.	3. Replace the cable.
	4. Parameter setting is inadequate.	4. Recheck and change PRM206.
080	EEPROM Writing error	An error occurs on EEPROM check in power ON.
	1. An inconsistency is identified by checking after EEPROM WRITE.	1-1. Reset or turn ON power again. 1-2. Clear RAM if it is not released by power recharge.
082	EEPROM clear error	An error occurs during an EEPROM check in power ON.
	1. An inconsistency identified by checking after the content of EEPROM is erased.	1-1. Reset or turn ON power again. 1-2. Clear RAM if it is not released by power recharge.

Err. No.	Description of alarm / Cause	Details / Countermeasures
083	EEPROM address G, CH writing error	An error occurs during EEPROM check in power ON.
	1. After EEPROM writing, a check mode indicates that the data of address G is inadequate. 2. The memorized channel number is not valid.	1-1. Reset or turn ON power again. 1-2. Clear RAM if it is not released by power recharge.
084	EEPROM address J writing error	An error occurs during EEPROM check in power ON.
	1. After EEPROM writing, a check mode indicates that the data of address J is inadequate.	1-1. Reset or turn ON power again. 1-2. Clear RAM if it is not released by power recharge.
085	EEPROM address P/F writing error	An error occurs during EEPROM check in power ON.
	1. After EEPROM writing, a check mode indicates that the data of address P/F is inadequate.	1-1. Reset or turn ON power again. 1-2. Clear RAM if it is not released by power recharge.
086	EEPROM address D/E writing error	An error occurs during EEPROM check in power ON.
	1. After EEPROM writing, a check mode indicates that the data of address D/E is inadequate.	1-1. Reset or turn ON power again. 1-2. Clear RAM if it is not released by power recharge.
087	EEPROM address A/L writing error	An error occurs during EEPROM check in power ON.
	1. After EEPROM writing, a check mode indicates that the data of address A/L is inadequate.	1-1. Reset or turn ON power again. 1-2. Clear RAM if it is not released by power recharge.
089	EEPROM check error	An error occurs during EEPROM check in power ON.
	1. An inconsistent or incorrect data is detected during EEPROM check in power ON.	1-1. Turn ON power again. 1-2. Clear RAM if it is not released by power recharge.
090	NC pulse CPU connection time out	A failure occurs in data communications between the main CPU and the target CPU.
	1. A failure in data communications	1. Reset.
091	Power OFF alarm	1. Parameter that requires power distribution is changed.
	1. Parameter that requires power distribution is changed. 2. Parameter is inputted from outside equipment.	1,2. Turn ON power again.

Err. No.	Description of alarm	Details
	C a u s e	C o u n t e r m e a s u r e s
092	Power ON error	Data fetching fails in power ON.
	1. Data fetching fails in power ON.	1. Reset or turn ON power again.
200	External ZRN input WZERO specification error	WZRN is commanded with EXT ZRN INPUT before determining MZERO position.
	1. WZRN is commanded at the state of NOT READY (PRM123=0)	1. Determine the MZERO position before commanding to WZRN
201	WZRN alarm	Command is issued by **WZERO** key or through communication to WZRN before determining MZERO position.
	1. WZRN is commanded at the state of NOT READY (PRM123=0).	1. Determine the MZERO position before commanding to WZRN
202	Stack underflow	Program error
	1. Subroutine return is executed at J-1 without subroutine call.	1. Check and correct the program.
203	Stack overflow	Program error
	1. Nesting exceeds 8 while repeating G27. 2. Jump command is executed during subroutine call.	1,2. Check and correct the program.
204	Not return alarm	Program error
	1. Return command is not executed at the final block when subroutine call is executed at the address J.	1. Check and correct the program.
205	Positioning time over	Deviation amount does not become smaller than the set value for PRM010 within the duration set at PRM009 after distribution is finished while droop check is valid.
	1. Overloading. 2. The set time for droop check PRM009 is short. 3. The set amount of droop check PRM010 is small.	1. Reduce the load. If speed cannot be reduced within the acceleration time, servo adjustment is required. 2. Make the droop check set time larger than acceleration time. 3. Make the droop check set amount larger.

Err. No.	Description of alarm Cause	Details Countermeasures
207	Divide command (DIV) error	Divide command value is incorrect.
	1. Processed angular value of divide command becomes 0.001° or less.	1. Command angular divide DIV <0.001°
208	G27 data 0 data error	The values of address P, E, L are inadequate when G27 is executed.
	1. Any of the addresses P E L is set to zero, or is not set at all when G27 is executed.	1. Check and correct the program.
209	G27 P>E error	The relation between the addresses P and E at G27 is inadequate.
	1. The value of the address P is larger than the address E when G27 is executed.	1. Check and correct the program.
210	F data error	Rev. speed is not set during the program.
	1. Rev. speed is not commanded to the address F when the program is executed.	1. Check and correct the program.
213 214	Software limit Software limit	Current position or the reached position exceeds the limited area.
	1. Manual operation exceeds the software limit PRM103 for normal motion when PRM100=1 or 2. 2. Automatic operation exceeds the software limit PRM103 for normal motion when PRM100= 2. 3. Manual operation exceeds the software limit PRM101 for reverse motion when PRM100=1 or 2 . 4. Automatic operation exceeds the software limit PRM103 for reverse motion when PRM100= 2. 5. Main board's fails.	1 4 Correct the value of the parameter if PRM101 and PRM103 are in adequate. 1 3 Perform manual operation with a great care. 2 4 Check and correct the program. 5. Replace the controller (main board).
215	Zero return alarm	Over travel signal and ZRN deceleration signal are inputted simultaneously in ZRN.
	1. Cable is broken or short-circuited. 2. Wrong wiring.	1. Replace the cable. 2. Correct the wiring.
216	Angle error in ABS	Program error.
	1. Angular command is issued for more than 360 when an absolute command is in effect.	1. Check and correct the program.

Err. No.	Description of alarm	Details
	Cause	Countermeasures
217	G99FIN time out	G99 check signal for handshake does not turn ON within the designated duration.
	1. G99 check signal is not detected within the set time for PRM028 when PRM027=1	1. See if G99FIN circuit functions properly.
	2. Either PRM028 is zero, or PRM029 is other than 2, when PRM027=1.(determined during automatic operation)	2. Check and correct the parameter.
218	Channel set alarm	When channel select is executed at binary mode after CHSET input, wrong channel is selected.
	1. Channel setting becomes inadequate when external channel is changed.	1. Replace the controller (main board).
	2. Channel number is not displayed when program is transferred.	2. Check the transfer content and send normal data.
219	External mode selection error	Input of the both external signals, AUTOSET and MANUALSET are detected.
	1. Wiring of AUTOSET or ANUALSET is short-circuited.	1. Check and correct the circuit of AUTOSET and MANUALSET. Replace the cable when CB3 cable is incorrect.
230	G09 execution axis error	Program error.
	1. In the case of 2-axis controller, the axes that were not used for G08 command are used for G09 command.	1. Check the program and correct them so that the same axes as used for G08 command are used for G09 command.
800	Address error	The transfer program is inadequate.
	1. The display shows other than /A/ nor /B/ when program is transferred.	1,2. Check the transfer content and send normal data.
	2. An address that does not exist is transferred.	
	3. NC program is not enclosed with / or [ ] when remote controlled.	3. Check the content of the remote program command and send normal data.
801	NC axis command error	The transfer program is inadequate.
	1. /A/ or /b/ is displayed on the NC program transferred through remote control single-axis specification.	1,2. Check the transfer content and send normal data.
	2. The letter behind / is not A,B, / or [.	
803	NC set range over	The transfer program is inadequate.
	1. The set value of the NC program address is wrong when automatic operation is performed.	1. Check the address of the sending program and send normal data.

Err. No.	Description of alarm	Details
	Cause	Countermeasures
804	NC channel number error	The transfer program is inadequate.
	1. NC program channel number is wrong when automatic operation is performed.	1. Check the channel number of the sending program and send normal data.
805	NC block number error	The transfer program is inadequate.
	1. NC program block number is wrong, when automatic operation is performed	1. Check the block number of the sending program and send normal data.
808	NC command error	Program error.
	1. G code that became failure because of the internal processing, is executed.	1. Reset the failure.
820	RS232C Hardware alarm	Communication failure
	1. The top of the host command is not DC2. 2. The end of the host command is not DC4.	1,2. Transfer the control code of XON/XOFF at a normal state.
	3. The message received in the host connection exceeds 256 characters.	3. Make a communication data consisting of 256 characters or less.
826	Flaming alarm	Communication failure
	1. Transfer speed of RS232C does not correspond to the controller.	1. Make the communication protocol corresponding to it on controller side.
827	Parity alarm	Communication failure
	1. Parity bit of the transfer data for RS232C does not correspond to the controller.	1. Make the communication protocol corresponding to it on controller side.
851	Illegal command alarm	Transfer command of the remote control (RC) is wrong.
	1. Received a host command that does not correspond with RC.	1. Check the transfer command on the machine, and send a correct command.
852	No command alarm	Transfer command of the remote control (RC) is wrong.
	1. Received STT, STA and STB command when no program exists in CH99 at RC	1. Check the transfer command on the machine, and send a correct command.
853	Illegal G-code, address alarm	Received the remote control (RC) code incorrectly.
	1. Addresses that do not correspond with G code (A,D,F,…) exist. 2. Received G code that does not exist at RC. 3. Received an address J at RC.	1 3. Check the transfer command on the machine, and send a correct command.

Err. No.	Description of alarm	Details
	Cause	Countermeasures
854	Over-run alarm	Internal error
	1. Receiving buffer is full.	1. Reset failure.
855	Command receiving disable mode	Remote control (RC) mode is wrong.
	1. Neither AUTO nor SINGLE mode is selected when receiving a host command to order an operation.	1. Select AUTO or SINGLE mode when executing remote control.
901	EEPROM program area error	Program EDIT is wrong.
	1. Block copy is executed at the final block.	1. Block copy cannot be executed at the final block. Use an expansion channel if the number of blocks in the channel is not enough.
911	Parameter input error	Remote control mode is wrong.
	1. **INPUT** key is pushed regardless of parameter CHANGE or UNCHANGE in PARAM mode when PRM110 is not 1, or PRM110 is not 999.	2. Set PRM110 at 1 or 999 when changing the parameter.
930	Program channel number input error	Selected the channel number that cannot be selected.
	1. Selected the channel the block number of which is 0.	1. The channel the parameter of which is 0 cannot be selected for PRM400 PRM489.
931	Program block number input error	Selected the block number that cannot be selected.
	1. Selected a block number that does not exist.	1. Block numbers higher than set value for PRM400 PRM489 cannot be selected.
940	Program G-code input error	The set value for Program G-code is wrong.
	1. Input a wrong value for program G code. 2. G-code in the sending program through communication is wrong.	1. Input an adequate value for G-code. 2. Check the transfer content program and send normal data.

Err. No.	Description of alarm / Cause	Details / Countermeasures
941	Program J-address input error	The set value for J code in the program is wrong.
942	Program F-address input error	The set value for F code in the program is wrong.
943	Program P-address input error	The set value for P code in the program is wrong.
944	Program A-address input error	The set value for A code in the program is wrong.
945	Program L-address input error	The set value for L code in the program is wrong.
946	Program D-address input error	The set value for D code in the program is wrong.
947	Program E-address input error	The set value for E code in the program is wrong.
	1. Input the wrong value for the program address. 2. The address in the sending program through communication is wrong.	1. Input a right value for the address. 2. Check the transfer content program and send normal data.
950	Parameter range over	Attempted to set an incorrect value to the parameter set area.
	1. A wrong value is set for the parameter.	1. Input the value settable in the parameter range
951	CH block variable change error	An internal error
	1. The total number of the blocks exceeds 2000 when PRM390 is not 0. 2. Program must be deleted when PRM390 is set to 1.	1. Set the total number of blocks at 2000 or less. 2. Backup the program if existing program is necessary. Set PRM390=2 if the program is not necessary.
952	Block set error.	Wrong blocks are selected when setting an extension channel.
	1. The setting of the number of blocks in CHOO is 0 when PRM390 is not 0. 2. When the channels used for CH00 CH89 are not continuous.	1. When PRM390 is not 0, 0 cannot be set for CH00. 2. Set the blocks to PRM400 PRM489 of continuous channels.
961	EDIT block copy error	A failure occurs in an automatic generation of block numbers such as jump command during copying blocks.
	1. The starting block for G27 falls on the final block. 2. The finishing block for G27 falls on the final block. 3. Final block copy is executed when the destination of jump is the final block	1,2. Check and correct the program for G27command block. 3. Block cannot be copied at the final block.

Err. No.	Description of alarm	Details
	C a u s e	C o u n t e r m e a s u r e s
962	EDIT Illegal G-code	A failure is checked at G codes (07,22,25) co the program check.
	1. Address A is set empty at G07 command. 2. Address A is set empty at G25 command. 3. Jump command does not exist at G25 command. 4. When operating with two-axis, only one axis has G22 command.	1 4. Check and correct the program.

Err. No.	Description of alarm	Details
	Cause	Countermeasures
020	Parameter destruction	EEPROM data that stores parameter is incorrect.
	1. Power cuts off during parameter-WRITE.	1. Initialize the parameter to reset it.
	2. The number of times of parameter-WRITE exceeds the limit.	2. Replace the servo pack.
030	Main circuit detection error	
	1. Servo pack is broken.	1. Replace the servo pack.
040	Parameter setup error	Parameter is full in set area.
	1. EEPROM and peripheral circuit are broken.	1. Replace the servo pack.
041	Dividing pulse output set error	
	1. Set value for PRM566 is wrong.	1. Check and correct PRM566.
050	Combination error	Motor capacity exceeds the limit for combination structure.
	1. The capacities of servo pack and motor are not conformed.	1. Check the motor capacity.
	2. Parameter written in encoder is wrong.	2. Replace the motor.
	3. Servo pack substrate is broken.	3. Replace the servo pack.
100	Over current or overheat of heat sink	Excessive current flows on the power transistor. Heat sink is overheated.
	1. Servo pack substrate and thermo switch are not connected properly.	1. Replace the servo pack.
	2. U, V, W and the grounding cables are not connected properly.	2,3. Check and correct the wiring.
	3. The phases among the motors U, V and W are short-circuited.	
	4. The load exceeds the regenerative processing capacity.	4. Review the loading and operation conditions.
	5. Servo pack fan stops.	5,6. Replace the servo pack.
	6. Servo pack is broken.	
300	Regenerative error	
	1. Servo pack substrate is broken.	1. Replace the servo pack.
	2. Regenerative resistance wiring is wrong.	2. Check and correct the wiring.
	3. Servo pack is broken.	3. Replace the servo pack.

Err. No.	Description of alarm	Details
	Cause	Countermeasures
320	Regenerative overload	Regenerative energy exceeds the limit.
	1. Servo pack substrate is broken.	1. Replace the servo pack.
	2. Regenerative energy exceeds the limit.	2. Review the loading and operation conditions.
	3. Power source voltage exceeds 270V.	3. Set an adequate voltage.
	4. Servo pack is broken.	4. Replace the servo pack.
330	Main circuit power source wiring error	
	1. Servo pack is broken.	1. Replace the servo pack.
	2. AD power source is supplied with DC power source input. Or DC power source is supplied with AC power source input.	2-1. Check and correct the wiring. 2-2. Check PRM501 and set it to 0.
	3. PRM633 is not 0 when regenerative resistance is not connected.	3. Check PRM633 and set it to 0.
400	Over voltage	DC voltage in the main circuit exceeds DC410V.
	1. AD power source voltage exceeds 290V.	1. Set AC power source voltage within the normal range.
	2. Working frequency is high, and loading moment of inertia is high.	2. Review the loading and operation conditions.
	3. Servo pack is broken.	3. Replace the servo pack.
410	Under voltage	DC voltage in the main circuit is below DC170V.
	1. AC power source voltage is below 120V.	1. Adjust AC power source voltage within the normal range.
	2. Servo pack fuse is meltdown.	2,3. Replace the servo pack.
	3. Inrush current limit resistance is broken.	
	4. Momentary blackout occurs.	4. Reset the alarm and start an operation.
	5. Motor and cable are short-circuited.	5. Replace the motor. Repair the cable.
510	Over speed	Feedback speed that exceeds the maximum frequency × 1.1 is detected.
	1. Servo pack substrate is broken.	1. Replace the servo pack.
	2. The order among U, V and W phases in the motor wiring is wrong.	2. Correct the motor wiring.
	3. Encoder wiring is wrong.	3. Correct the encoder wiring.
	4. Noise occurs in the encoder and it is operated in mistake.	4. Countermeasures against noise in the encoder wiring.
	5. Over input of commands for location and speed.	5. Reduce the command value.
511	Dividing pulse output speed	
	1. Dividing pulse output frequency exceeds 1.6MHz.	1-1. Check the PG dividing ratio (PRM566). 1-2. Reduce the motor revolving speed.

Err. No.	Description of alarm	Details
	Cause	Countermeasures
520	Vibration alarm	Abnormal vibration is detected during the motor rotation.
	1. Abnormal vibration is detected during the motor rotation.	1-1. Reduce the revolving speed. 1-2. Reduce the speed loop gain (PRM510).
	2. The value of moment of inertia is higher than real value. Or it changes with great fluctuation.	2. Set the ratio of moment of inertia (PRM513) within an adequate range.
710	Over load (Momentary maximum load)	High load is rotated instantaneously.
720	Over load (Continuous maximum load)	Load is rotated for a certain period with a torque exceeding the rating.
	1. Servo pack is broken.	1. Replace the servo pack.
	2. Motor wiring is incorrect.	2. Correct the motor wiring.
	3. Encoder wiring is incorrect.	3. Correct the encoder wiring.
	4. Effective torque exceeds the rated torque.	4,5. Review the conditions for loading and operation.
	5. Startup torque exceeds either the rated torque or the maximum torque by a large margin.	
730	DB over load	Rotating energy when dynamic brake (DB) is shut down exceeds the capacity of DB resistance.
	1. Servo pack substrate is broken.	1. Replace the servo pack.
	2. Rotating energy when dynamic brake (DB) is shut down exceeds the capacity of DB resistance.	2-1. Reduce the working frequency for motor. 2-2. Reduce the load moment of inertia. 2-3. Reduce the occurrence of DB shutdown.
740	Inrush current limit resistance overload	Switch the main circuit power source ON/OFF at the frequency that exceeds 10times/2min.
	1. Servo pack substrate is broken.	1. Replace the servo pack.
	2. Inrush current resistance exceeds the limit of permissible frequency when the main circuit power source is ON/OFF.	2. The number of times for the main circuit power source to switch ON/OFF must be 5 times per min. or less.
7A0	Heat sink overheat	The temperature of the heat sink in the servo pack exceeds 100 .
	1. Servo pack substrate is broken.	1 3. Replace the servo pack.
	2. Servo pack substrate and thermo switch are not connected properly.	
	3. Servo pack fan stops.	
	4. The load exceeds the rated load.	4. Review the conditions for loading and operation.
	5. The ambient temperature of the servo pack exceeds 55 .	5. Lower the ambient temperature around the controller.

Err. No.	Description of alarm	Details
	Cause	Countermeasures
810	Encoder backup alarm	Encoder location data is cleared.
	1. Servo pack substrate is broken. 2. Power is supplied to the absolute encoder for the first time. 3. Encoder cable is detached from the motor. 4. Both PC power source (+5V) from servo pack and battery power source are down. 5. Absolute encoder is broken.	1. Replace the servo pack. 2,3. Set location data based on machine zero return method. 4. Check the PG wiring. Correct +5V supply. 5. Replace the servo motor.
820	Encoder same check alarm	Encoder crosscheck is incorrect.
	1. Servo pack is broken. 2. Absolute encoder is broken.	1. Replace the servo pack. 2. Replace the servo motor.
830	Encoder battery alarm	The battery voltage does not reach the rated value within 2 4 seconds after the control source is supplied.
	1. Servo pack is broken. 2. Battery voltage is lower than the rated value (2.7V). 3. Batteries are not connected properly, or not connected at all.	1. Replace the servo pack. 2. Replace the battery. 3. Connect the batteries properly.
840	Encoder data alarm	Abnormality occurs in the encoder data.
	1. Servo pack substrate is broken. 2. Encoder's improper operation. 3. Encoder is broken.	1. Replace the servo pack. 2. Take proper measures on wiring and peripherals of the encoder. Divide the interconnections between encoder and power source. 3. Replace the motor.
850	Encoder over speed	Motor rotates at the fixed speed or higher when encoder power source is supplied.
	1. Motor rotates at 200min^{-1} or higher when encoder power source is supplied. 2. Servo pack substrate is broken. 3. Encoder is broken.	1. Turn on the encoder power source when the motor rotation speed is 200min^{-1} or lower. 2. Replace the servo pack. 3. Replace the motor.

Err. No.	Description of alarm	Details
	Cause	Countermeasures
860	Encoder overheat	The temperature of the encoder is high.
	1. Motor is operated at the load exceeding the rated load.	1. Set the motor load within the rated values.
	2. Motor is in continuous operation.	2. Reduce the motor rotation speed.
	3. Servo pack substrate is broken.	3. Replace the servo pack.
	4. Encoder is broken.	4. Replace the motor.
B10	Speed command A/D error	An error occurs in speed command read-in.
	1. Servo pack substrate is broken.	1. Replace the servo pack.
	2. Malfunction of the speed command input read-in unit.	2. Reset the alarm and start operation.
B20	Torque command A/D error	An error occurs in torque command read-in.
	1. Servo pack substrate is broken.	1. Replace the servo pack.
	2. Malfunction of the torque command input read-in unit.	2. Reset the alarm and start operation.
B31	Current detection alarm 1	An error occurs in the U phase current detection circuit.
	1. Malfunction of U phase current detection circuit.	1. Replace the servo pack.
B32	Current detection alarm 2	An error occurs in the V phase current detection circuit.
	1. Malfunction of V phase current detection circuit.	1. Replace the servo pack.
B33	Current detection alarm 3	An error occurs in the current detection circuit.
	1. Malfunction of current detection circuit.	1. Replace the servo pack.
	2. Motor cable is broken.	2. Review the motor wiring.
BF0	System alarm 0	An error in the internal program processing
BF1	System alarm 1	Internal program operation error.
BF2	System alarm 2	Current control processing internal program error.
BF3	System alarm 3	An error in the encoder interface processing unit.
BF4	System alarm 4	CPUWDT error
	1. Servo pack substrate is broken.	1. Replace the servo pack.
C10	Burn-up check detection	Servo motor burns-up.
	1. The order among U, V and W phases in motor wiring is wrong.	1. Review the motor wiring.
	2. Servo pack is broken.	2. Replace the servo pack.
	3. Encoder is broken.	3. Replace the motor.

Err. No.	Description of alarm Cause	Details Countermeasures
C80	Encoder clear error	
	1. Servo pack is broken. 2. Encoder is broken.	1. Replace the servo pack. 2. Replace the motor.
C90	Encoder communication error	No communication can be made between the servo pack and the encoder.
C91	Encoder communication position data acceleration error	
C92	Encoder communication timer error	
CB0	Encoder echo back error	
	1. Encoder connection error. Contact error. 2. Noise generates because of the different encoder cable specification. 3. Noise generates because encoder cable is long. 4. Encoder cable is bundled with large-sized current cable, or runs close to it. 5. FG fluctuates with the influences from the welder with the motor. 6. Excessive vibration impact on the encoder. 7. Servo pack is broken. 8. Encoder is broken.	1. Correct the encoder wiring. 2. Use the specified cable. 3. The maximum wiring distance is 20m. 4. Remove serge-applied force from the encoder cable. 5. Route the grounding cable from machines to prevent the current branch to FG on PG. 6. Reduce the machine vibration or check the motor installation. 7. Servo pack is broken. 8. Encoder is broken.
CA0	Encoder parameter error	Encoder parameter is incorrect.
	1. Servo pack is broken. 2. Encoder is broken.	1. Replace the servo pack. 2. Replace the motor.
CC0	Multi-limit mis-compare	Encoder parameter error
	1. User constant for servo pack is wrong. 2. The setup of encoder multi turn limit value is wrong. 3. Encoder is broken.	1. Check PRM561. 2. Re-setup the gear ratio of PRM011. 3. Replace the motor.

Err. No.	Description of alarm	Details
	Cause	Countermeasures
D00	POS-DEV Over	Position deviation exceeds PRM623 when servo is ON.
	1. Servo pack substrate is broken.	1. Replace the servo pack.
	2. Connection among the motors U, V and W is wrong.	2. Correct the motor wiring.
	3. Motor gain adjustment error.	3. Raise the set values of velocity loop gain (PRM510) and position loop gain (PRM512).
	4. Frequency of position command pulse is too high.	4.1. Raise or reduce the frequency of position command pulse.
		4.2. Review the electronic gear ratio.
	5. Position deviation over level (PRM623) is not adequate.	5. Optimize the position deviation over level (PRM623).
	6. Load condition and motor specification are not adequate.	6. Review the load.
D01	Servo OFF POS-DEV over	
	1. Position deviations are accumulated excessively when servo is OFF.	1. Keep the motor stop when servo is OFF.
D02	Servo ON POS-DEV over	
	1. When servo is turned ON with position deviations increased, command pulse is inputted during operation at the limited speed, exceeding the position deviation over alarm level (PRM623).	1-1. Keep the motor stop when servo is OFF.
		1-2. Optimize the limited velocity level (PRM628) when servo is ON.
F10	Power line open-phase	In either R, S or T phase remains at low voltage for 1 second when the main power source is ON.
	1. Servo pack is broken.	1. Replace the servo pack.
	2. Wiring for three-phase power source is wrong.	2. Correct the power source wiring.
	3. Imbalance in the three-phase power source.	3. Repair the imbalance in the power source (Replacement among phases).
F20	Motor cable disconnection	Motor cable is disconnected.
	1. Motor cable is disconnected.	1. Review the motor wiring.
CPU00	Main CPU communication error	Communication between the controller main board and servo pack is incorrect.
	1. Communication cable connection error	1. Check the connection of communication cable. Replace the cable.
	2. Main board is broken.	2. Replace the controller.
	3. Servo pack is broken.	3. Replace the servo pack.
400	Machine zero position unset	Machine zero position is not set yet.
	1. Machine zero position is not established yet.	1. Set machine zero position. (See the section; machine zero positioning)

Detailed explanation on the alarm for Err.016

Pattern

The following shows a flowchart of troubleshooting for Err.016 that occurs when the power is ON, or during clamp after table rotation.

```
┌─────────────────────────────┐
│   Error .016 occurred       │
└─────────────────────────────┘
              │
              ▼
       ╱────────────╲          No
      ╱  Is the      ╲   ──────────▶  ┌───────────────────────────┐
      ╲  pressure     ╱                │  Check the pressure source. │
       ╲ source normal?╱               └───────────────────────────┘
              │
             Yes
              │
              ▼
```

Is the pressure source normal? — No → Check the pressure source.

Yes

Did the air pressure reduce when error .016 occurred? — Yes → PRM038=1 — No → Error .016 occurs either when clamp pressure goes below the detective pressure for 5 seconds or more, or when unclamp signal is kept ON exceeding the set time for PRM023. Take measures to prevent the clamp pressure from going down.

PRM038=1 — Yes → Error .016 occurs when pressure goes down exceeding the set time for PRM024 during clamping.

No

Did not the brake output (DC24V) when clamping? — No → PRM039=1 — No → Make the setup value PRM039= 1.

See the checking method 1

PRM039=1 — Yes → Internal circuit is considered to be incorrect.
Contact our the service department.

Yes

Is the clamp check signal (SP1) normal? — No → Either a failure of clamp check pressure switch SP1, or breakdown of clamp wiring is considered.
As for replacement, see the instruction manual of NC circular table.

See the checking method 2

Yes

Error .016 does not occur under this situation.
Contact our service department if an alarm occurs.

Checking Method

A. Use the self-diagnostic function.

Method   Push ▨(CL/DGN) to display self-diagnostic screen and push ▨(CL/DGN) six times to check EA-0(Output signal for each axis).

A 011OO BRAKE ON

EA-O

BRAKE ON

The above BRAKE   ON shows the following information.

0 : Non-excitation   Clamped

1 : Excitation   Unclamped

Checking Method

B. Use the self-diagnostic function.

Method   Push ▨(CL/DGN) to display self-diagnostic screen and push ▨(CL/DGN) four times to check EA-I(Input signal for each axis).

A 1O1OOO CLAMP

EA-I

UNCLAMP
CLAMP

In the case of the checking method 2, items shown below are normal.

0 : Not detecting   Unclamp checked

1 : Detecting   Clamp checked

Clamp signal and unclamp signal never become 1 or 0 simultaneously under normal situation.

However it could happen just for a moment when solenoid is changed.

Detailed explanation on the alarm for Err.016

Pattern 2

The following shows a flowchart of troubleshooting for Err.016 that occurs soon after the rotation starts or during.

```
                        ┌─────────────────────┐
                        │  Error .016 occurred │
                        └─────────────────────┘
                                  Yes
                                   │
                                   ▼
                        ┌────────────────┐      No                        ┌──────────────────────────────────────┐
                        │ Is the clamp   │ ─────────────────────────────▶ │ Either internal circuit error or     │
                        │ output normal? │   See the checking method 3    │ break down of the brake wiring is    │
                        └────────────────┘                                │ considered.                          │
                                  Yes                                     │ Contact our service department if no │
                                   │                                      │ error was detected in the wiring     │
                                   ▼                                      │ check.                               │
                        ┌────────────────┐                               └──────────────────────────────────────┘
                        │ Was clamp      │  Yes   ┌───────────┐  No        ┌──────────────────────────────────────┐
                        │ signal checked │ ─────▶ │ PRM038=1  │ ─────────▶ │ Error .016 occurs either when        │
                        │ when error     │        └───────────┘            │ unclamp signal is kept OFF exceeding │
                        │ .016 occurred? │            Yes                  │ the set time for PRM023 during       │
                        └────────────────┘             │                  │ unclamping.                          │
                                  No                    │                  └──────────────────────────────────────┘
                                   │                    │                  ┌──────────────────────────────────────┐
                                   │                    └────────────────▶ │ Error .016 occurs when clamp signal  │
                                   │                                       │ is kept ON exceeding the set time    │
                                   │                                       │ for PRM024 during unclamping         │
                                   │                                       │ If any abnormality above is not      │
                                   ▼                                       │ checked, internal circuit may be     │
                        ┌────────────────┐      No                        │ incorrect.                           │
                        │ Did the brake  │ ─────────────────────────────▶ │ Contact our the service department.  │
                        │ output when    │                                └──────────────────────────────────────┘
                        │ unclamping?    │                                ┌──────────────────────────────────────┐
                        └────────────────┘                                │ Either a failure of unclamp check    │
   See the checking        Yes                                            │ pressure switch SP2 or breakdown of  │
   method 4                 │                                             │ unclamp wiring is considered.        │
                            ▼                                             │ As for replacement, see the          │
              ┌───────────────────────────────────────┐                  │ instruction manual of NC circular    │
              │ Error .016 does not occur under this   │                  │ table.                               │
              │ situation.                             │                  └──────────────────────────────────────┘
              │ Contact our service department if an   │
              │ alarm occurs.                          │
              └───────────────────────────────────────┘
```

Check Method

    C.   Use the self-diagnostic function.

       Method   Push [CL/DGN](CL/DGN) to display self-diagnostic screen and push [CL/DGN](CL/DGN) six times to check EA-0(Output signal for each axis).

```
A  01100  BRAKE  ON
                        EA-0
```
BRAKE ON

       The above BRAKE   ON shows the following information.

          0 : Non-excitation   State of clamp

          1 : Excitation   State of unclamp

Check Method

    D.   Use the self-diagnostic function.

       Method   Push [CL/DGN](CL/DGN) to display self-diagnostic screen and push [CL/DGN](CL/DGN) four times to check EA-1(Input signal for each axis).

```
A  011000  CLAMP
                    EA-1
```
UNCLAMP
CLAMP
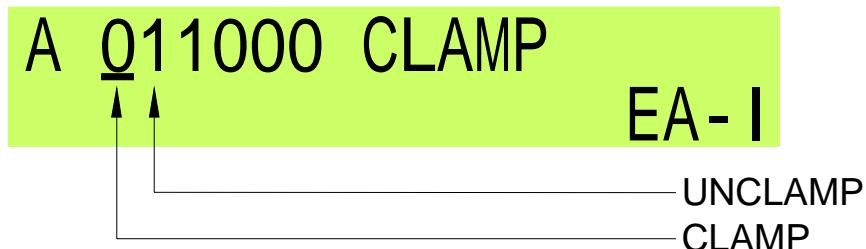
       In the case of the checking method 4, items shown below are normal.

          0 : Not detecting   Clamp checked

          1 : Detecting   Unclamp checked

    Pattern

If Error .016 occurs when the power is ON and brake is not used (PRM032=1), take measures of troubleshooting in the pattern 2 after the section of "Do you hear the exhaust sound when brake is OFF as for air?".

2. RAM Clear

When RAM clear is performed, because inputted data and set work zero position are erased and the reconstitution of data becomes impossible, take extreme care of operation.

It is recommended to save the program data, parameter data and work zero position with the external equipment.

Though the following RAM clear modes are provided, unless otherwise special reasons are provided, do not use these modes.

1.	Program data Parameter	All clear	Initialization
2.	Program data	All clear	
3.	Parameter data	All clear	Initialization
4.	Initialization of system information	System information	Initialization

2.1.   All data clear of programs and parameter data

When this operation is performed, all data (programs, parameters and work zero position) stored into the memory in the controller are erased to return the memory to an initial setting state.

The all clear modes of program data and parameter data can be used continuously. For details, refer to each item.

1)   [O CH]   [CL/DGN >/◁]   ➔   The all clear mode (CL-1) of program is entered in power ON.

       POWER ON

$$CL-1$$

<u>Program Clear Screen</u>

2)   [ENT]   ➔   When the all clear of program is started, ALL PRG DEL flickers and ALL PRG END is displayed, the all clear mode is finished, the mode is shifted to the parameter clear mode.

$$CL-2$$

<u>Parameter Clear Screen</u>

> Even if **CAN** is pushed during program clear, the program clear mode cannot be interrupted.

3)   [ENT]   ➔   Number "1" (Standard) is displayed on the right side of " CL-2" display by inputting **ENT** .

4)   [ ]   [ENT]   ➔   Selects that the parameter clear is performed at which content.

         1   General parameter of MAC mini I series
         2   General parameter of MAC mini iH series
         3   Servo parameter

The parameter clear is started and the value during clear is counted on the right side. When CL-2 END is displayed, the clear mode is finished.

> Even if **CAN** is pushed during parameter clear, the parameter clear mode cannot be interrupted.

5)   Starting screen   ➔   The same screen as a starting state in usual power ON is displayed to start the screen.

> Because parameter clear is performed, Err.400 MZERO POS UN-SETUP and Err.930 ENC BATTERY ALARM occur certainly.

2.2.   All data clear of programs

When this operation is performed, only program data stored into the memory in the controller is erased.

1) ┌──┐ ┌──┐   ➜   The all clear mode (CL-1) of program is entered in power ON.
    │1 E│ │CL/DGN│
    └──┘ └──┘
       POWER ON   ┌──────────────────────────────┐
                         │ CL-1   │
                         │   │
                         └──────────────────────────────┘
                                     Program Clear Screen

2) ┌──┐   ➜   When the all clear of program is started, ALL PRG DEL   flickers
    │ENT│   and ALL PRG END   is displayed, the all clear mode is finished, the
    └──┘   mode is shifted to the parameter clear mode.

                         ┌──┐
                         │ Even if │ CAN │ is pushed during program clear, the program │
                         │ clear mode cannot be interrupted.   │
                         └──┘

3) Starting screen ➜   The same screen as a starting state in usual power ON is displayed to
                         start the screen.

2.3.　　All data clear of parameter

When this operation is performed, the parameter data stored into the memory in the controller is initially set.

1) 2_L [CL/DGN] ➜ The all clear mode (CL-2) of program is entered in power ON.

   POWER ON

CL-2

Parameter Clear Screen

2) [ENT] ➜ Number "1" (Standard) is displayed on the right side of "CL-2" display by inputting **ENT** .

3) [ ] [ENT] ➜ Selects that the parameter clear is performed at which content.

      1   General parameter of MAC mini I series

      2   General parameter of MAC mini iH series

      3   Servo parameter

The parameter clear is started and the value during clear is counted on the right side. When CL-2 END is displayed, the clear mode is finished.

> Even if **CAN** is pushed during parameter clear, the parameter clear mode cannot be interrupted.

4) Starting screen ➜ The same screen as a starting state in usual power ON is displayed to start the screen.

> Because parameter clear is performed, Err.400 MZERO POS UN-SETUP and Err.930 ENC BATTERY ALARM occur certainly.

2.4.   Initialization of system information

When this operation is performed, the controller information into the memory in the controller is rewritten to the information of a new system.
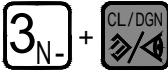
1) **[3]** **[CL/DGN]** → The initialization mode of system information mode (CL-3) of
   POWER ON   program is entered in power ON.

   CL-3

   Initialization Screen of system information

2) **[ENT]** → The initialization of system information is started by inputting
              ENT , " EEPROM INIT" is displayed and the character of
              " EEPROM INIT" flickers during initialization.

   Even if **CAN** is pushed during initialization of system information, the initialization mode cannot be interrupted.

3) Starting screen → The same screen as a starting state in usual power ON is displayed to start the screen.

3   Adjustment

3.1.   Servo Adjustment

When the unbalanced workpiece or jig is mounted to the rotary table, vibration, abnormal noise, etc., may occur.

At this time, the set values for servo parameters for adjusting servo are shown in the following list.

If their parameters are inadequate for the machine, the vibration and abnormal noise may be increased. Therefore, check the machine operation so that the machine can be stopped immediately when operating the machine after changing the parameter.

M/C rigid set No.	Speed loop gain	Speed loop integral gain	Pos. loop gain	Torque command filter time constant	Inertia
	PRM510	PRM511	PRM512	PRM584	
1	150	6000	150	250	**Large**
2	200	4500	200	200	
3	300	3000	300	130	
4	400	2000	400	100	
5	600	1500	600	70	**Small**

If the vibration and abnormal noise occur at standard value, change the parameter to the lower number of machine rigid.

3.2.   Brightness control of pendant LCD

Hole plug

Rear View of Pendant
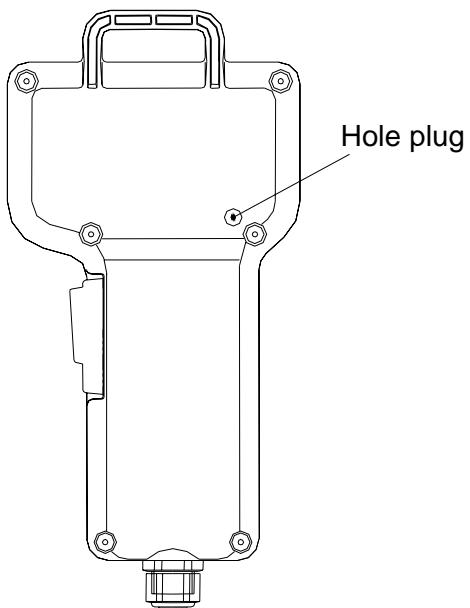
Brightness control steps

1. Remove the hole plug located on the rear face of pendant (See left figure) (Inside volume switch can be checked from hole).

2. The volume switch can be turned with the minus screw driver to right or left in order to adjust LCD brightness.

3. Adjust LCD to optimum brightness, watching the LCD screen.

4. After adjusting, return the hole plug to the original position.
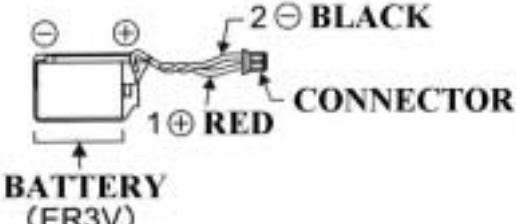
4   Battery for Absolute Encoder

4. 1.   Specifications

The motor for MAC mini i is the absolute encoder and takes the back-up data with lithium battery. In case something happens on the lithium battery for data back-up, the encoder data disappears. When the voltage of the lithium battery becomes lower than the specified value,   Error 830 Encoder Battery Alarm appears and therefore, the lithium battery should be changed along with the instruction below.

Lithium Battery Specifications

Model	JZSP-BA01 YASKAWA ELECTRIC Corp. Battery ER3V Toshiba Battery Corp.
Specifications	3.6V 1000mAh
Outside View	

4. 2   How to change

Turn MAC mini i on,

Take off the CB1i cable from the motor case and pull off the inside part of CB1i cable from inside the motor case. The battery is fixed on the inside part of CB1i cable.

Take off the present battery from connector and put the new battery.

Tighten up the battery on the cable with a band and put the CB1i cable connection back to as it is.

Remarks

> The original position for Machine should be re-set up, if changing the battery would be carried out while turning MAC mini i off.

CONNECTION MANUAL

■   Readers for This Manual

Readers for this manual are as follows:

➢   Persons who create detailed design

➢   Persons who make installation work

➢   Persons who perform maintenance and inspection

C o n t e n t s

1   Appearance

1.1.   Appearance of MAC mini iH / iHF

MAC mini iH / iHF are equipped with each pendant in Clause 1.3.
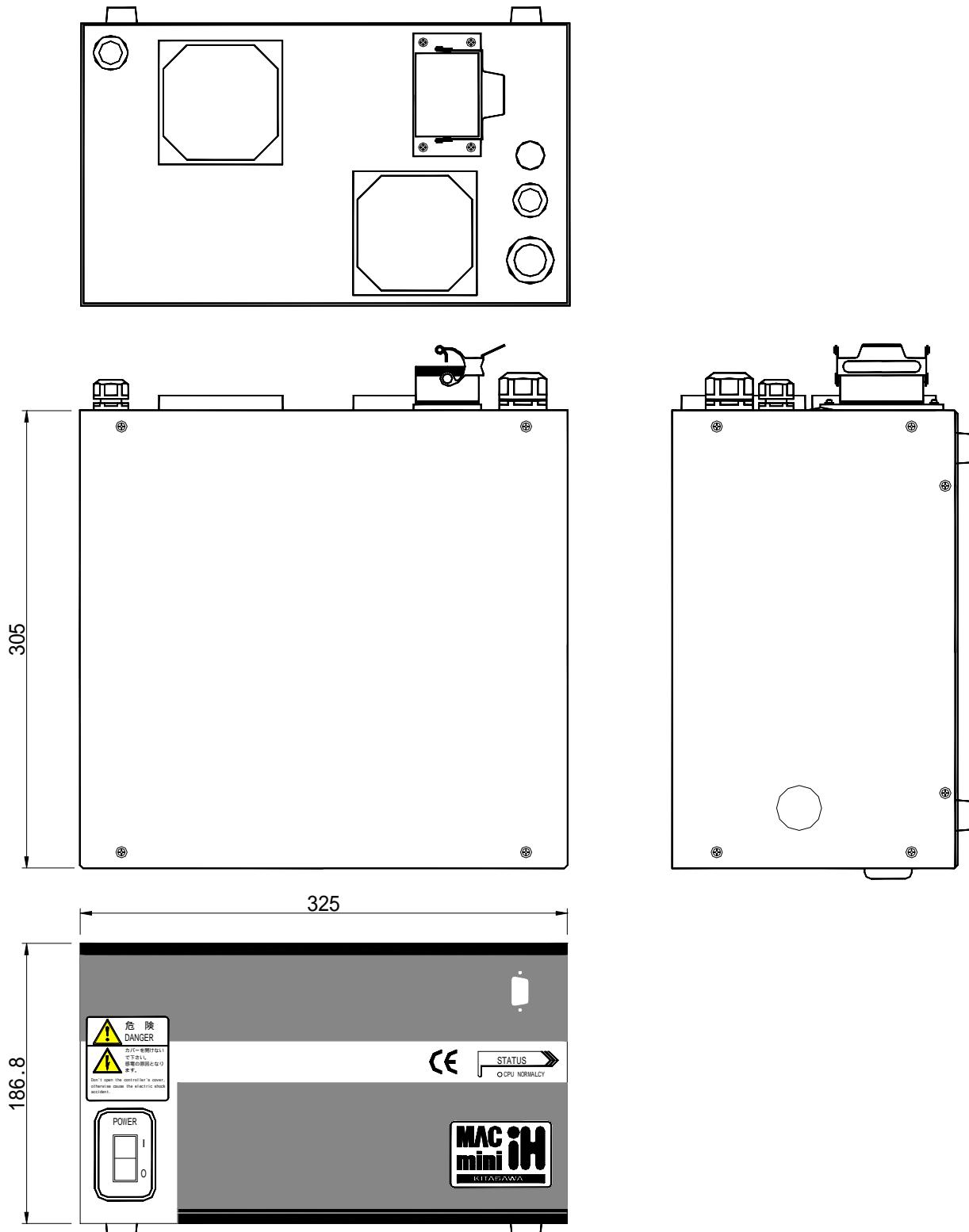
1.2.   Appearance of MAC mini iH2 / iHT / iHP

MAC mini iH2 / iHT / iHP are equipped with each pendant in Clause 1.3.
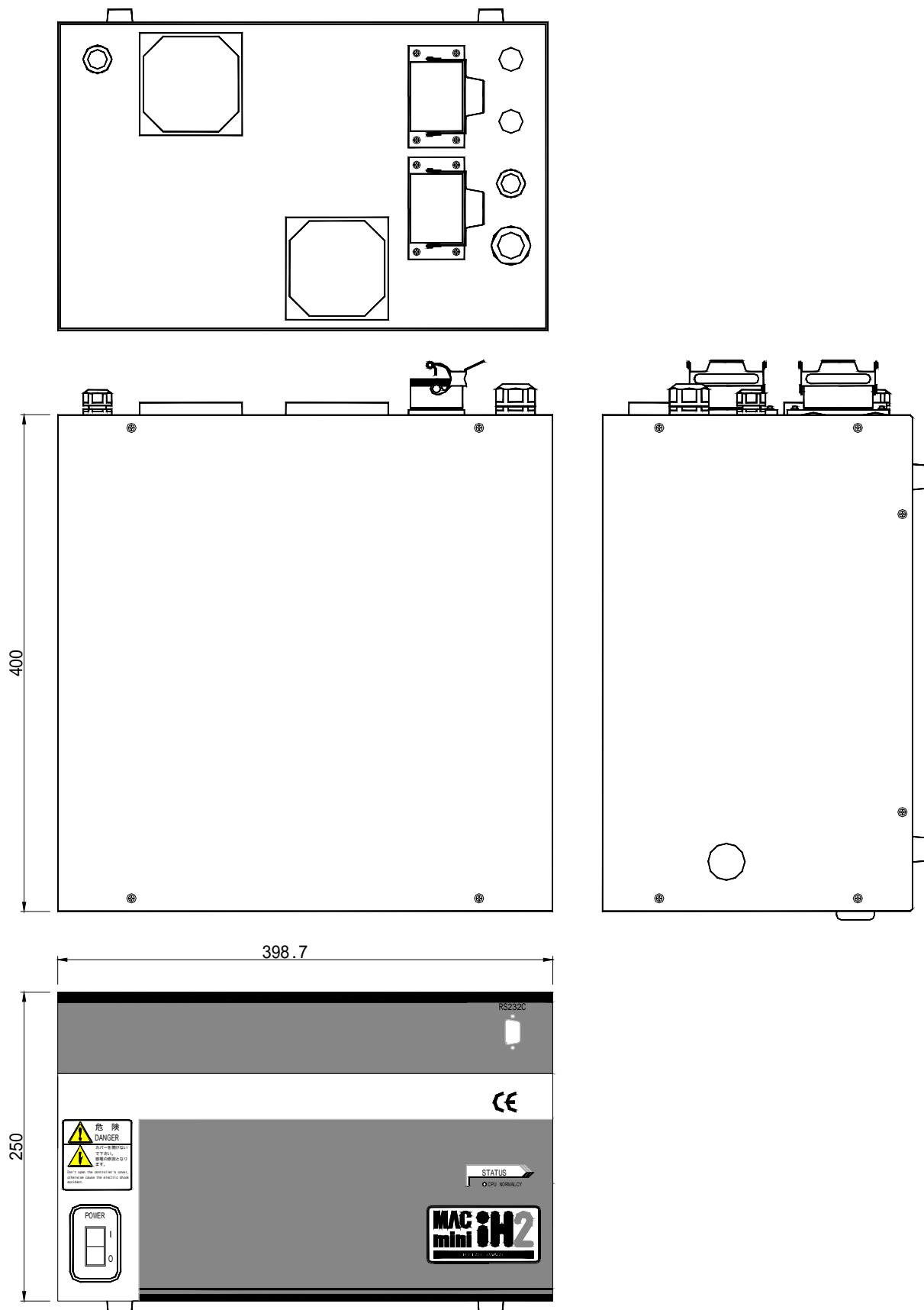
1.3. Appearance of pendant
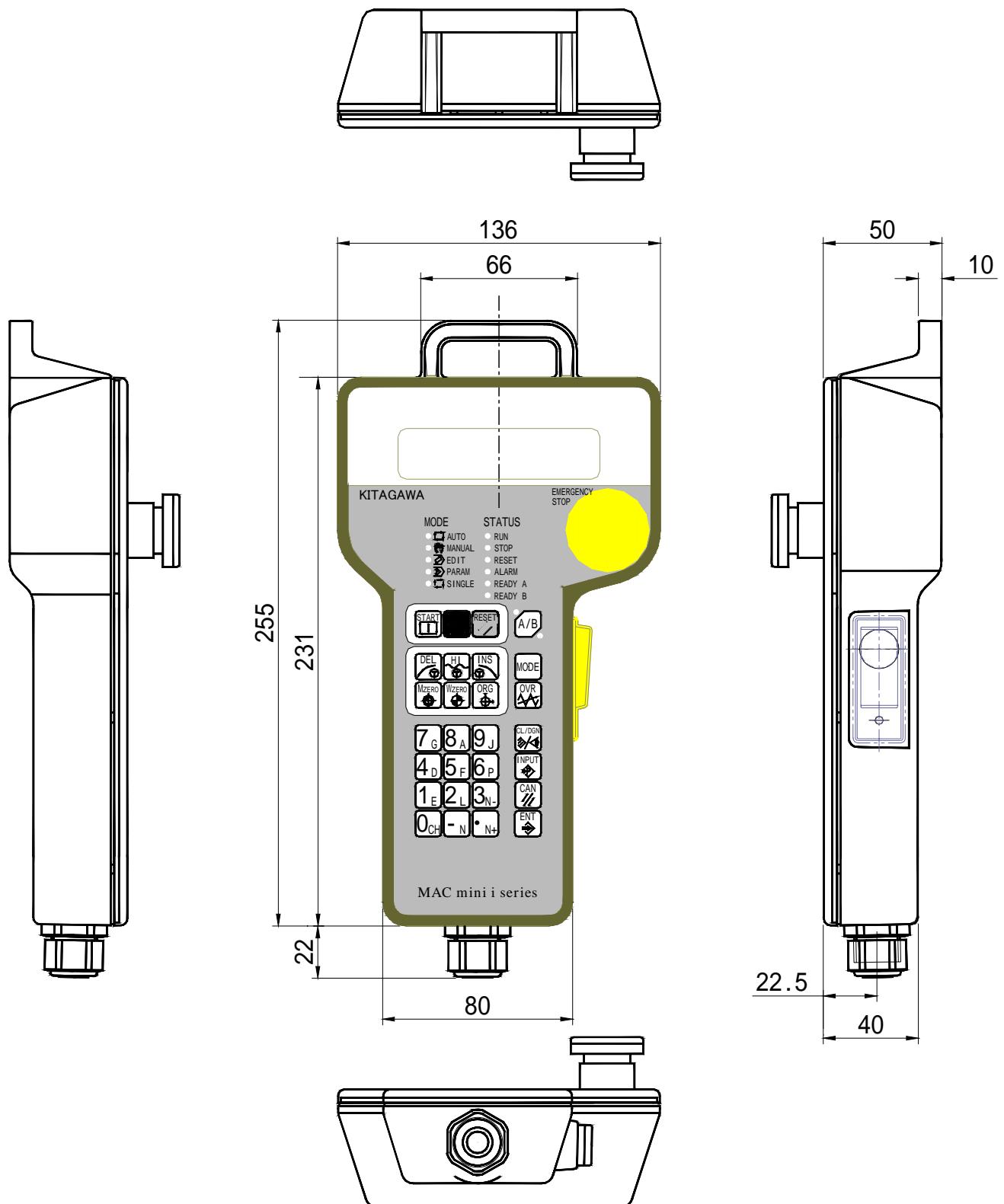
The controller may be changed without prior notice because of modification, spec., change, etc.

2　　Power Connection

2.1.　Power

2.1.1.
INPUT power voltage range

Input power voltage of AC200/230V is used at range of +10 ,-10 .

The frequency of 50/60Hz is used.

Precautions

If power exceeds AC230V+10 , the machine damage will be caused.

2.1.2.
Momentary power interruption

① A momentary power interruption of 1-cycle or less is not detected.

② In the momentary power interruption between 1-cycle and 4-cycle, the machine stops or restarts normally.

③ When the momentary power interruption exceeding 4-cycle, the machine restarts.

※ Restarting means that the power is turned ON from OFF.

2.1.3.
Withstand power noise

The power noise from external equipment is to be within 1.5KV(50n 1μ sec). If the power noise exceeds 1.5KV, the machine damage will be caused.

2.2　Grounding

Route a grounding cable at C-class grounding (Grounding resistance value 100 or less)or more.

※ The machine without routing a grounding cable may cause an electric shock.

3.   Interactive Connection Diagram

The interactive connection diagram of controller is shown every type.

3.1.   MAC mini iH / iHF Types

PEN1

5000

To circuit protector.

CB4i Cable (power cable)

1.25-M4

5000   700

CB3i Cable (external connection cable)

1.25-YASS3.5

5000   1500

CB1i Cable (table connection cable)

5000

CB2i Cable (external SOL cable)

BRAKE1

OPTION

1.25-YASS3.5

5000   100

RS232C Cable   OPTION

Cable for manual pulse generator
OPTION

Manual pulse generator   OPTION

3.2.   MAC mini iH2 / iHT Types

PEN1

5000

To circuit protector.

CB4i Cable (power cable)

1.25-M4

5000   700

NC1

NCOP1

CB3i Cable (external connection cable)

1.25-YASS3.5

5000   1500

NC2

CB1i HB Cable (table connection cable)

5000

CB1i HA Cable (table connection cable)

5000

BRAKE1

CB2i Cable (external SOL cable for A-axis)

OPTION   1.25-YASS3.5

5000   100

BRAKE2

CB2i B Cable (external SOL cable for B-axis)

OPTION   1.25-YASS3.5

5000   100

RS232C Cable   OPTION

Cable for manual pulse generator
OPTION

Manual pulse generator   OPTION

3.3.   MAC mini iHP Type

PEN1

To circuit protector.

CB4i Cable (power cable)

2-M4

5000

5000   700

CB3i Cable (external connection cable)

1.25-YASS3.5

5000   1500

CB1i Cable (external connection cable)

5000

CB2i Cable (external SOL cable)

OPTION

1.25-YASS3.5

BRAKE1

5000   100

RS232C Cable   OPTION

Cable for manual pulse generator

OPTION

Manual pulse generator   OPTION

4   Connection Cable

The connection cable CB1i (Controller   Circular table) of MAC mini iH Series differs by the controller.

     CB1HA Cable   MAC mini iH / iH2 / iHT

     CB1iF Cable   MAC mini iHF

     CB1iHB Cable   MAC mini iH2 / iHT

The cable of CB1iH type is equipped with a polyamide and metal blade.

4.1.   CB1iHA Cable
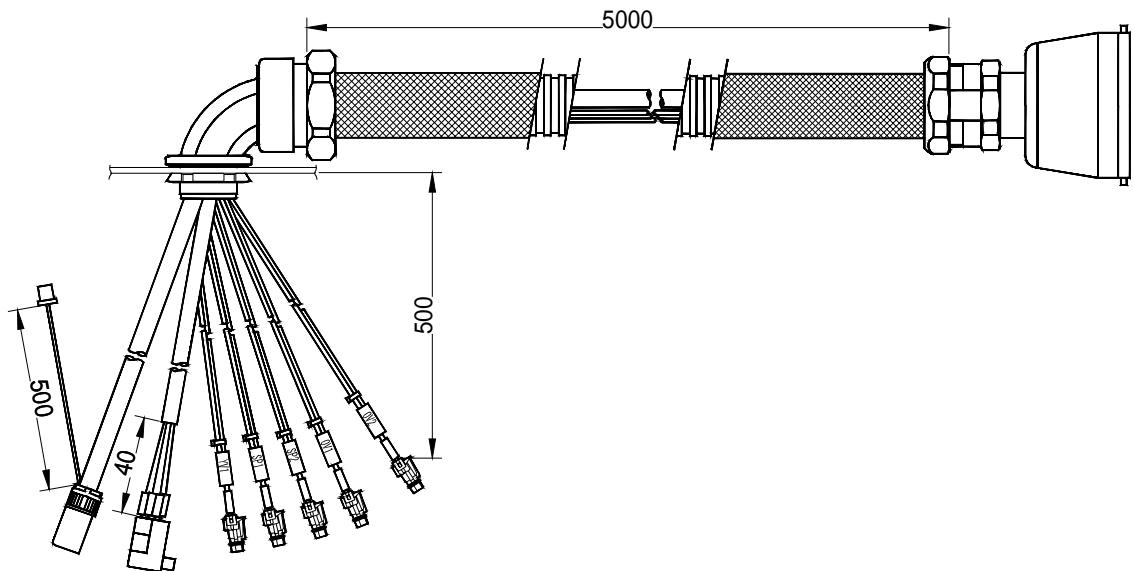
Signal Name	Controller Side		Table side		Cable Spec.	Wire No. Color	Remarks
	Name	Pin No	Name	Pin No			
MU1	CB1A-M	1	MOTOR1	4	0.75SQ× 4 core	Brown	Motor U
MV1		2		3		Blue	Motor V
MW1		3		2		Black	Motor W
PE		SHELL		1		Green/yellow	PE
BK.C1		4	BK.C1	2	CAV 0.5SQ	Blue	Clamp check
COM		5		1	CAV 0.5SQ	Blue	INPUT common
COM		7	BK.UC1	1	CAV 0.5SQ	Red	INPUT common
BK.UC1		6		2	CAV 0.5SQ	Red	Unclamp check
OVRUNA1		10	OT.A1	2	CAV 0.5SQ	White	Overrun A1 check
COM		11		1	CAV 0.5SQ	White	INPUT common
OVRUNB1		12	OT.B1	2	CAV 0.5SQ	Black	Overrun B1 check
COM		13		1	CAV 0.5SQ	Black	INPUT common
BK+1		14	BK.1	2	CAV 0.5SQ	Blue	Brake OUTPUT
BK-1		15		1	CAV 0.5SQ	Blue	Brake OUTPUT
BAT+1		18	PG1	9	Batch shield 0.2SQ× 3P	Red	Battery power
BAT-1		19		8		Red bar	Battery power
PS1		20		4		Green	PS1 Signal
/PS1		21		5		Green bar	/PS1 Signal
PG5V1		16		6		Black	PG Power +
PG0V1		17		3		Black bar	PG Power -
SG		22		SHELL		Shield	PG Shield
BAT+1	BAT1	1	PG1	9	0.2SQ× 1P	Black	Battery power
BAT-1		2		8		black/white	Battery power

Connector Type List

Connector Name	Connector Type	Maker
CB1A-M	CDDM24	I.L.M.E.
MOTOR1	JZSP-CSM9-3	JST Nippon crimp terminal
BK.C1 ,BK.UC1 OT.A1	52117-241	MOLEX
BK.1	52117-341	
BAT1	DF3-2EP-2C	HRS HIROSE DENKI
PG1	54346-0020	MOLEX

4.2.　　CB1iHF Cable

Signal Name	Controller Side		Table side		Cable Spec.	Wire No. Color	Remarks
	Name	Pin No	Name	Pin No			
MU1		1		4		Brown	Motor U
MV1		2	MOTOR1	3	0.5SQ× 4 core	Blue	Motor V
MW1		3		2		Black	Motor W
PE		SHELL		1		Green/yellow	PE
BK.C1		4	BK.C1	2	CAV 0.5SQ	Blue	Clamp check
COM		5		1	CAV 0.5SQ	Blue	INPUT common
COM		7	BK.UC1	1	CAV 0.5SQ	Red	INPUT common
BK.UC1		6		2	CAV 0.5SQ	Red	Unclamp check
OVRUNA1		10	OT.A1	2	CAV 0.5SQ	White	Overrun A1 check
COM		11		1	CAV 0.5SQ	White	INPUT common
OVRUNB1	CB1A-M	12	OT.B1	2	CAV 0.5SQ	Black	Overrun B1 check
COM		13		1	CAV 0.5SQ	Black	INPUT common
BK+1		14	BK.1	2	CAV 0.5SQ	Blue	Brake　　OUTPUT
BK-1		15		1	CAV 0.5SQ	Blue	Brake　　OUTPUT
BAT+1		18		9		Red	Battery power
BAT-1		19		8		Red bar	Battery power
PS1		20		4		Green	PS1 Signal
/PS1		21	PG1	5	Batch shield 0.2SQ× 3P	Green bar	/PS1 Signal
PG5V1		16		6		Black	PG Power +
PG0V1		17		3		Black bar	PG Power -
SG		22		SHELL		Shield	PG Shield
BAT+1	BAT1	1	PG1	9	0.2SQ× 1P	Black	Battery power
BAT-1		2		8		black/white	Battery power

Connector Type List

Connector Name	Connector Type	Maker
CB1A-M	CDDM24	I.L.M.E.
MOTOR1	JZSP-CSM9-2	JST　Nippon crimp terminal
BK.C1　,BK.UC1　OT.A1	52117-241	MOLEX
BK.1	52117-341	
BAT1	DF3-2EP-2C	HRS　HIROSE DENKI
PG1	54346-0020	MOLEX

4.3.   **CB1iHB Cable**
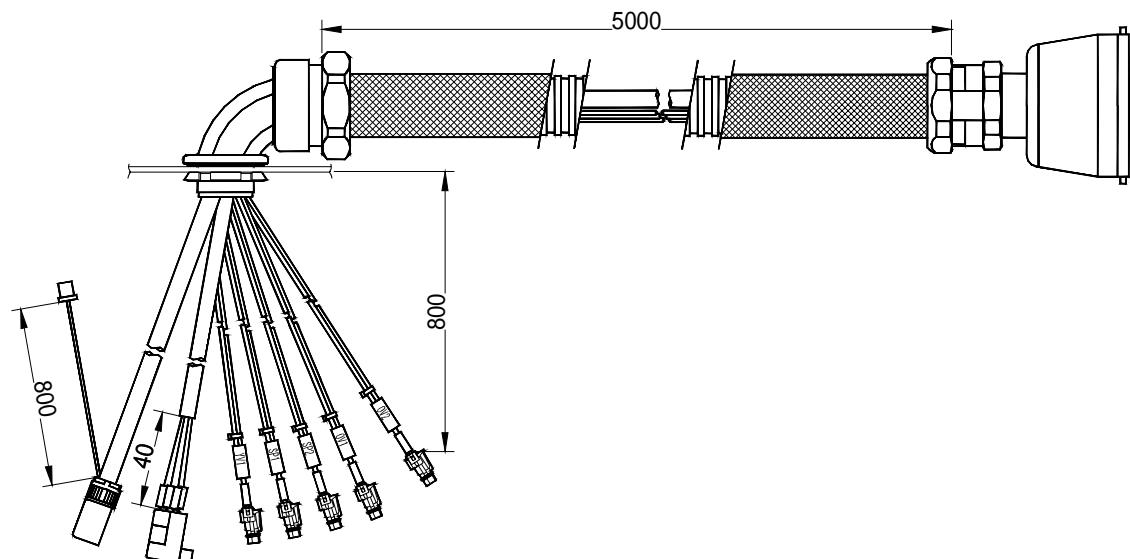
Signal Name	Controller Side		Table side		Cable Spec.	Wire No. Color	Remarks
	Name	Pin No	Name	Pin No			
MU2		1	MOTOR2	4	0.75SQ× 4 core	Brown	Motor U
MV2		2		3		Blue	Motor V
MW2		3		2		Black	Motor W
PE		SHELL		1		Green/yellow	PE
BK.C2		4	BK.C2	2	CAV 0.5SQ	Blue	Clamp check
COM		5		1	CAV 0.5SQ	Blue	INPUT common
COM		7	BK.UC2	1	CAV 0.5SQ	Red	INPUT common
BK.UC2		6		2	CAV 0.5SQ	Red	Unclamp check
OVRUNA2		10	OT.A2	2	CAV 0.5SQ	White	Overrun A2 check
COM		11		1	CAV 0.5SQ	White	INPUT common
OVRUNB2	CB1A-M	12	OT.B2	2	CAV 0.5SQ	Black	Overrun B2 check
COM		13		1	CAV 0.5SQ	Black	INPUT common
BK+2		14	BK.2	2	CAV 0.5SQ	Blue	Brake OUTPUT
BK-2		15		1	CAV 0.5SQ	Blue	Brake OUTPUT
BAT+2		18	PG2	9	Batch shield 0.2SQ× 3P	Red	Battery power
BAT-2		19		8		Red bar	Battery power
PS2		20		4		Green	PS1 Signal
/PS2		21		5		Green bar	/PS1 Signal
PG5V2		16		6		Black	PG Power +
PG0V2		17		3		Black bar	PG Power -
SG		22		SHELL		Shield	PG Shield
BAT+2	BAT2	1	PG2	9	0.2SQ× 1P	Black	Battery power
BAT-2		2		8		black/white	Battery power

Connector Type List

Connector Name	Connector Type	Maker
CB1A-M	CDDM24	I.L.M.E.
MOTOR2	JZSP-CSM9-3	JST Nippon crimp terminal
BK.C2, BK.UC2 OT.A2, OT.B2,	52117-241	MOLEX
BK, 2	52117-341	
BAT2	DF3-2EP-2C	HRS HIROSE DENKI
PG2	54346-0020	MOLEX

5   CB2i Cable (External SOL Cable)

Since the NC circular table of hydraulic clamp spec., is equipped with the solenoid valve for clamp to the external equipment, it is necessary to output the power for clamping from the controller.

In this case, the cable of CB2i is connected.

The cable of CB2i is connected to the connector for the brake of main board in the controller.

However, the voltage outputted for the external solenoid is used for only DC24V 0.5A.

The CB2i cable is attached to only hydraulic clamp type. Other circular tables are not equipped with its cable.
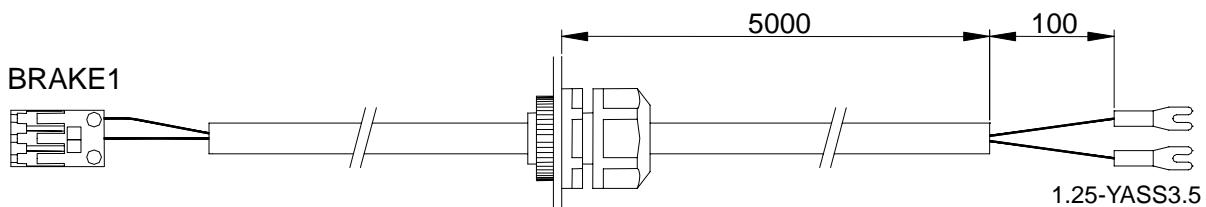
CB2i cable is packed together with cable clamp parts.

MAC mini iH/iHF / iHP

Cable Name	Connector	Pin No.	Terminal Indication	Remarks
CB2i	BRAKE1	1	BK+1	DC24V Brake OUTPUT
		2	BK-1	DC24V Brake OUTPUT

MAC mini iH2 / iHT

Cable Name	Connector	Pin No.	Terminal Indication	Remarks
CB2i	BRAKE1	1	BK+1	DC24V Brake OUTPUT for A-axis
		2	BK-1	DC24V Brake OUTPUT for A-axis
CB2i2	BRAKE2	1	BK+2	DC24V Brake OUTPUT for B-axis
		2	BK-2	DC24V Brake OUTPUT for B-axis

6   CB3i Cable   External Connection Cable

To communicate signals between the controller and the external equipment, the CB3icable is used.
The controller is connected with the cable corresponding to the controller specification. This CB3i
cable is used for MAC mini i / iF.

     CB3iHA Cable   MAC mini iH / iHF / iHP

     CB3iHB Cable   MAC mini iH2 / iHT

6.1.   CB3iHA Cable

No	Connector in panel		Wiring color	Signal Name	Signal Display	Cable Spec.
	Name	Pin No.				
1		1	Black	BLOCK FINISH	BLKFIN	
2		2	White	BLOCK FINISH COMMON	BLKFINCOM	
3		3	Red	OPT FINISH OUTPUT 1	G99FIN1	
4		4	Green	360° OUTPUT 1	360FIN1	
5		5	Yellow	ALARM A-CONTACT OUTPUT	ALMOUTA	
6		6	Blown	ALARM B-CONTACT OUTPUT	ALMOUTB	
7			Blue	ZRN FINISH 1	ZRNFIN1	
8		8	Gray	OUTPUT COMMON 1	OUTCOM1	
9		9	Orange	STOP	SP	
10	NC1	10	Bright green	START	ST	UL2464 AWG20× 33-core
11		11	Pink	CHANNEL SELECT 0	CHSEL0	
12		12	Violet	CHANNEL SELECT 1	CHSEL1	
13		13	Black(short bar)	CHANNEL SELECT 2	CHSEL2	
14		14	White(short bar)	CHANNEL SELECT 3	CHSEL3	
15		15	Red(short bar)	CHANNEL SET	CHSET	
16		16	Green(short bar)	EXE EMG STOP INPUT	EXTEM	
17		17	Yellow(short bar)	INPUT COMMON	INCOM	
18		18	Blown(short bar)	INPUT COMMON	INCOM	
19		19	Blue(short bar)	EMG STOP OUTPUT	EMOUT	
20		20	Gray(short bar)	EMG STOP OUTPUT COMMON	EMOUTCOM	

No	Connector in panel		Wiring color	Signal Name	Signal Display	Cable Spec.
	Name	Pin No.				
21		1	Orange(short bar)	EXE RESET	RST	
22		2	Bright green (short bar)	EXE ZRN REQUEST 1	ZRN1	
23		3	Pink(short bar)	EXE ZRN REQUEST 2	ZRN2	
24		4	Violet(short bar)	EXE MANUAL MODE SELECT	MANUALSET	
25		5	Black(long bar)	EXE AUTO MODE SELECT	AUTOSET	
26		6	White(long bar)	CHANNEL NO. OUTPUT 0	SELOUT0	
27	NCOP1		Red(long bar)	CHANNEL NO. OUTPUT 1	SELOUT1	
28		8	Green(long bar)	CHANNEL NO. OUTPUT 2	SELOUT2	
29		9	Yellow(long bar)	CHANNEL NO. OUTPUT 3	SELOUT3	
30		10	Blown(long bar)	CHANNEL NO. OUTPUT 4	SELOUT4	
31		11	Blue(long bar)	CHANNEL NO. OUTPUT 5	SELOUT5	
32		12	Gray(long bar)	CHANNEL NO. OUTPUT 6	SELOUT6	
33		13				
34		14				
35		15	Orange(long bar)	OUTPUT COMMON 1	OUTCOM1	

Connector spec.

Connector Name	Parts Name	Type	Maker
NC1	Connector	DF1B-20DS-2.5RC	HIROSE ELECTRIC CO.
	Pin	DF1B-2022SC	HIROSE ELECTRIC CO.
NCOP1	Connector	DF1B-15S-2.5RC	HIROSE ELECTRIC CO.
	Pin	DF1B-2022SC	HIROSE ELECTRIC CO.

6.2. CB3iHB Cable

No	Connector in panel		Wiring color	Signal Name	Signal Display	Cable Spec.
	Name	Pin No.				
1		1	Black	BLOCK FINISH	BLKFIN	
2		2	White	BLOCK FINISH COMMON	BLKFINCOM	
3		3	Red	OPT FINISH OUTPUT 1	G99FIN1	
4		4	Green	360° OUTPUT 1	360FIN1	
5		5	Yellow	ALARM A-CONTACT OUTPUT	ALMOUTA	
6		6	Blown	ALARM B-CONTACT OUTPUT	ALMOUTB	
7			Blue	ZRN FINISH 1	ZRNFIN1	
8		8	Gray	OUTPUT COMMON 1	OUTCOM1	
9		9	Orange	STOP	SP	
10	NC1	10	Bright green	START	ST	UL2464 AWG20× 37-core
11		11	Pink	CHANNEL SELECT 0	CHSEL0	
12		12	Violet	CHANNEL SELECT 1	CHSEL1	
13		13	Black(short bar)	CHANNEL SELECT 2	CHSEL2	
14		14	White(short bar)	CHANNEL SELECT 3	CHSEL3	
15		15	Red(short bar)	CHANNEL SET	CHSET	
16		16	Green(short bar)	EXE EMG STOP INPUT	EXTEM	
17		17	Yellow(short bar)	INPUT COMMON	INCOM	
18		18	Blown(short bar)	INPUT COMMON	INCOM	
19		19	Blue(short bar)	EMG STOP OUTPUT	EMOUT	
20		20	Gray(short bar)	EMG STOP OUTPUT COMMON	EMOUTCOM	

No	Connector in panel		Wiring color	Signal Name	Signal Display	Cable Spec.
	Name	Pin No.				
21	NCOP1	1	Orange(short bar)	EXE RESET	RST	
22		2	Bright green (short bar)	EXE ZRN REQUEST 1	ZRN1	
23		3	Pink(short bar)	EXE ZRN REQUEST 2	ZRN2	
24		4	Violet(short bar)	EXE MANUAL MODE SELECT	MANUALSET	
25		5	Black(long bar)	EXE AUTO MODE SELECT	AUTOSET	
26		6	White(long bar)	CHANNEL NO. OUTPUT 0	SELOUT0	
27			Red(long bar)	CHANNEL NO. OUTPUT 1	SELOUT1	
28		8	Green(long bar)	CHANNEL NO. OUTPUT 2	SELOUT2	
29		9	Yellow(long bar)	CHANNEL NO. OUTPUT 3	SELOUT3	
30		10	Blown(long bar)	CHANNEL NO. OUTPUT 4	SELOUT4	
31		11	Blue(long bar)	CHANNEL NO. OUTPUT 5	SELOUT5	
32		12	Gray(long bar)	CHANNEL NO. OUTPUT 6	SELOUT6	
33		13				
34		14				
35		15	Orange(long bar)	OUTPUT COMMON 1	OUTCOM1	
36	NC2	1	Bright green (long bar)	OPT FINISH OUTPUT 2	G99FIN2	
37		2	Pink(long bar)	360° OUTPUT 2	360FIN2	
38		3	Violet(long bar)	ZRN FINISH 2	ZRNFIN2	
39		4	Black/white	OUTPUT COMMON 2	OUTCOM2	

Connector Spec.

Connector Name	Parts Name	Type	Maker
NC1	Connector	DF1B-20DS-2.5RC	HIROSE ELECTRIC CO.
	Pin	DF1B-2022SC	HIROSE ELECTRIC CO.
NCOP1	Connector	DF1B-15S-2.5RC	HIROSE ELECTRIC CO.
	Pin	DF1B-2022SC	HIROSE ELECTRIC CO.
NC2	Connector	DF1B-4S-2.5RC	HIROSE ELECTRIC CO.
	Pin	DF1B-2022SC	HIROSE ELECTRIC CO.

7   CB4i Cable (Power Cable)

CB4i cable for power supply of controller differs by type.

CB4iHA Cable	MAC mini iH / iHF / iH2 / iHT
CB4iHB Cable	MAC mini iHP

7.1.   CB4iHA Cable
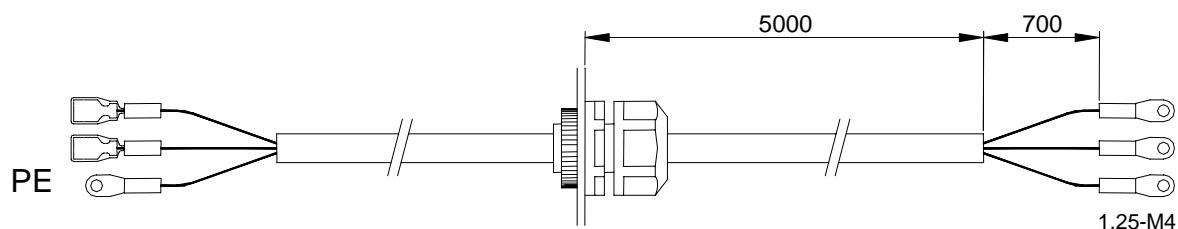
MAC mini iH / iHF / iH2 / iHT

No.	Signal Name	Terminal Indication	Cable Spec.	Cable Color	Power
1	Power 1	L1		Brown	
2	Power 2	L2	1.5SQ× 3C	Blue	1 AC200/230V± 10%
3	PE(Grounding)	PE		Green/Yellow	

7.2.   CB4iHB Cable
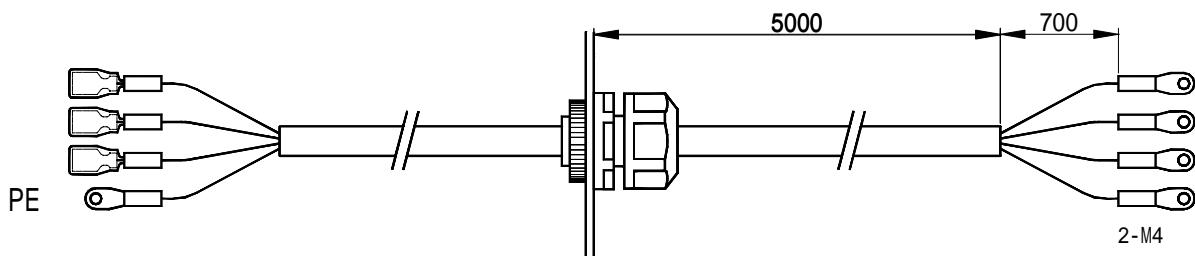
MAC mini iHP

No.	Signal Name	Terminal Indication	Cable Spec.	Cable Color	Power
1	Power 1	L1		Brown	
2	Power 2	L2	2.5SQ× 4C	Blue	3 AC200/230V± 10%
3	Power 3	L3		Black	
4	PE(Grounding)	PE		Green/Yellow	

8   I/O Signals

8.1.   Input signal

Two INPUT signals are provided for controller:

> ➢ Input signal from rotary table.

> ➢ Input signal from external terminal

8.1.1.
INPUT Signals
（for rotary table）

MAC mini iH / iHF / iHP

No.	Name	Signal	Description
1	CLAMP	BK.C1	Checks CLAMP of brake.
2	UNCLAMP	BK.UC1	Checks UNCLAMP of brake.
3	OVERRUN	OVRUNA1	Checks side of over-travel.
4		OVRUNB1	Checks side of over-travel.
5	COMMON	COM	Common line of No.1 4

MAC mini iH2 / iHT   2-axis controller

Axis	No.	Name	Signal	Description
1st Axis	1	CLAMP	BK.C1	Checks CLAMP of brake.
	2	UNCLAMP	BK.UC1	Checks UNCLAMP of brake.
	3	OVERRUN	OVRUNA1	Checks side of over-travel.
	4		OVRUNB1	Checks side of over-travel.
	5	COMMON	COM	Common line of No.1 4
2nd Axis	6	CLAMP	BK.C2	Checks CLAMP of brake.
	7	UNCLAMP	BK.UC2	Checks UNCLAMP of brake.
	8	OVERRUN	OVRUNA2	Checks side of over-travel.
	9		OVRUNB2	Checks side of over-travel.
	10	COMMON	COM	Common line of No.6 9

For these INPUT signals, an exclusive cable (CB1i) is routed to connect the controller and the rotary table.

8.1.1.1
BK.C signal

➢ Contents

CLAMP can be checked by short-circuiting BK. C and INCOM.

BK.C1 is for A-axis (single axis) and BK. C2 is for B-axis.

➢ Conditions

1. BK.C signal is for monitoring usually in case of PRM038=1, and it is unused in case of PRM038=0.
2. BK.C signal INPUT time is to be continuous 100msec or more.

8.1.1.2.
BK.UC Signal

➢ Contents

UNCLAMP can be checked by short-circuiting BK. C and INCOM.

BK.UC1 is for A-axis (single axis) and BK. UC2 is for B-axis.

➢ Conditions

1. BK.UC signal is for monitoring usually.
2. BK.UC signal INPUT time is to be continuous 100msec or more.

8.1.1.3.
OVRUN Signal

➢ Contents

OVER TRAVEL is checked by the signal between OVRUN and INCOM.

OVRUNA1 and OVRUNB1 are for A-axis (single), and OVRUNA2 and OVRUNB2 are for B-axis.

➢ Conditions

1. OVRUN signal is for monitoring usually.
2. OVRUN signal INPUT time is to be continuous 100msec or more.

8.1.2.
INPUT signals
(for external terminals)

The INPUT signals of controller vary every type.

The following list shows INPUT signals for the controller.

These signals are transmitted through CB3i cable.

Type	No.	Name	Signal	Description
Com.	1	START	ST	Executes program in "AUTO" or "SINGLE" mode.
	2	HOLD	SP	Decelerates and stops rotary table in "AUTO" or "SINGLE" mode.
	3	EXE EMG STOP	EXT EM	EMG STOP signal inputted from external terminal can stop rotary table immediately.
	4	CHANNEL SELECT	CHSEL0 CHSEL1 CHSEL2 CHSEL3	Selects program channel from external terminal by binary mode and M-signal mode.
	5	CHANNEL SET	CHSET	When EXE CHANNEL is finally selected, this code is inputted.
	6	RESET	RST	Can be reset from external terminal.
	7	AUTO MODE CHANGE	AUTOSET	Can be changed to AUTO mode.
	8	MANUAL MODE CHANGE	MANUALSET	Can be changed to MANUAL mode.
	9	EXE ZRN REQUEST	ZRN1	Performs MZRN or WZRN of 1st axis.
iH2 iHT	10		ZRN2	Performs MZRN or WZRN of 2nd axis.
Com.	11	INPUT COM	IN COM	Common line of No.1 10.
	12	INPUT COM	IN COM	

The above common type means MAC mini iH / iHF / iHP / iH2 / iHT.

**8.1.2.1.
ST Signal**

➢ Contents

The start (ST) signal is inputted by short-circuiting ST and IN COM.

The program of selected channel is executed under AUTO or SINGLE mode.

When the ST signal is inputted with the controller stopped temporarily, the program is restarted.

➢ Conditions

1. The ST signal is to be INVALID unless an input time is continuous 100msec or more.
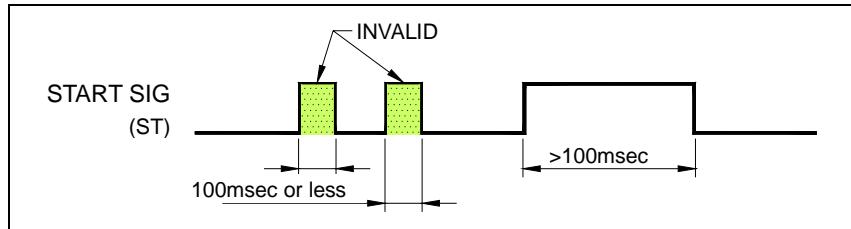
2. The AUTO or SINGLE mode is to be possible to start the program.

3. The program is not to be executed. (STATUS is not to be RUN. However, it is except in case of RUN+STOP.)

4. Any alarm is not to be occurred. (STATUS is not to be ALARM.)

5. Other START signals (Panel) are not to be INPUT state.

6. Temporary stop (SP) is to be ON.

7. BLKFIN is not to be outputted, and after BLKFIN is OFF, 100msec or more is to be passed.
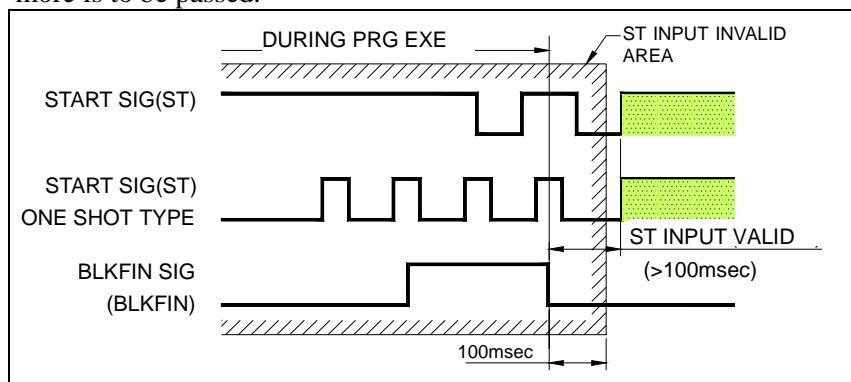
**8.1.2.2
SP signal**

➢ Content

The STOP signal is inputted by opening SP and IN COM.

The program operation is stopped temporarily.

➢ Conditions

1. To be during AUTO RUN. (STATUS is to be RUN.)

2. When SP signal is turned OFF during ST signal ON, the program operation is stopped immediately.

3. Even if ST signal is turned ON during SP signal OFF, AUTO RUN is not to be started.

8.1.2.3.
EXTEM signal

➢ Contents

The EMERGENCY STOP from the external equipment can be inputted by opening EXTEM and INCOM.

When the external EMERGENCY STOP is turned OFF, Err.002 EXT EMERGENCY SP occurs.

When the power supply to the motor is turned OFF and short-circuit is braked ON simultaneously, the motor is stopped immediately.

➢ Conditions

1. Usually monitored.

2. When EXTEM is OFF, it has priority over other functions (except EMG SP).

3. The motor must not be reset until EXTEM and INCOM are opened.

8.1.2.4.
External channel select signal

The external channel has two kinds of binary mode and M-signal mode, which are selected by parameters.

Each signal differs by a used mode.

8.1.2.5.
CHSEL0,1,2,3 signals (Binary type)

➢ Contents

When INCOM is short-circuited in order of CHSEL0 CHSEL1 CHSEL2 CHSEL3, the channel No. can be inputted at binary signal.

When the binary signal is inputted during AUTO mode, the channel No. can be selected.

However, this signal only selects the channel No., and it cannot perform a setting change. When the setting change is performed, it is necessary to input CHSET.

➢ Conditions

1. This mode is valid for only when PRM033=0 and also PRM112=1.

2. When STATUS is STOP or RESET state under AUTO mode, the binary signal can be changed.

3. The selection of channel inputted during BLKFIN or G99FIN output is to be invalid.

**8.1.2.6.
CHSEL0,1,2,3   signals
(M-signal type)**

➢ Contents

> When CHSEL0 and INCOM are short-circuited, channel No. 00 is selected as ZERO signal.
>
> When CHSEL1 and INCOM are short-circuited, channel No. is added one by one as PLUS1 signal.
>
> When CHSEL2 and INCOM are short-circuited, channel Nos. are added ten by ten as PLUS10 signal.
>
> When CHSEL3 and INCOM are short-circuited, channel Nos. are reduced ten by ten as PLUS10 signal.
>
> Channels can be increased to max. channels without exceeding its set value. (Max. value is determined to PRM390   PRM400   PRM489.

➢ Conditions

1. This mode is valid for only when PRM033=1 and also PRM112=1.
2. When STATUS is STOP or RESET state under AUTO mode, M-signal can be changed.
3. While any signal is being inputted, other signals cannot be inputted.
4. ZERO   PLUS1   PLUS10   MINUS10 signals are to be inputted continuously at 100msec or more.
5. ZERO signal and PLUS signal are continuously inputted, the intervals of 100msec or more are to be provided.
6. The selection of channel inputted during BLKFIN or G99FIN output is to be invalid.

**8.1.2.7.
CHSET signal**

➢ Contents

> When CHSET and INCOM are short-circuited during the binary mode, the channel can be changed.

➢ Conditions

1. This mode is valid for only when PRM033=0 and also PRM112=1.
2. When the channel setting mode is set to AUTO, STATUS is to be STOP or RESET state.
3. CHSET is to be continuously inputted for 500msec or more.
4. The selection of channel inputted during BLKFIN or G99FIN output is to be invalid.

**8.1.2.8.
RST signal**

> Contents

RESET mode is inputted by short-circuiting RST and INCOM.

Operational contents is the same as $\boxed{\textbf{RESET}}$ key on the panel and it

is shown in the following list.

> An alarm is released and the program is returned to top at EDIT mode.
> RESET operation varies by mode and status.

Mode	Status	Content
AUTO	RUN	PROGRAM STOP
	RUN STOP	PROGRAM RESET & REWIND
	STOP	PROGRAM RESET
	RESET	PROGRAM REWIND
	ALARM	ALARM RESET
EDIT		PROGRAM REWIND

> Conditions
  1. All RESET modes are to be valid.
  2. An RESET signal INPUT time is to be continuous 100msec or more.

**8.1.2.9.
ZRN signal**

The zero return INPUT signal is divided into two kinds (MZRN and WZRN by parameters) and it can be inputted for finishing to G99 OUTPU.

ZRN1 shows A-axis and ZRN2 B-axis.

**8.1.2.10.
MZRN**

> Contents

MZRN of A-axis is performed by short-circuiting ZRN1 and INCOM.

MZRN of B-axis is performed by short-circuiting ZRN2 and INCOM.

> Conditions
  1. PRM029 is 0. (PRM029=0)
  2. Only MANUAL mode is to be valid.
  3. ZRN signal INPUT time is continuous 100msec or more.

8.1.2.11.
WZRN

➢ Contents

WZRN of A-axis is performed by short-circuiting ZRN1 and INCOM.

WZRN of B-axis is performed by short-circuiting ZRN2 and INCOM.

➢ Conditions

1. PRM029 is 1. (PRM029=1)
2. Only MANUAL mode is to be valid.
3. ZRN signal INPUT time is continuous 100msec or more.
4. MZRN is to be finished.

8.1.2.12.
FIN signal for G99

➢ Contents

G99FIN1 OUTPUT of A-axis is turned OFF by short-circuiting ZRN1 and INCOM.

G99FIN2 OUTPUT of B-axis is turned OFF by short-circuiting ZRN2 and INCOM.

➢ Conditions

1. PRM029 is 2. (PRM029=2)
2. AUTO and SINGLE modes become valid.
3. ZRN signal INPUT time is continuous 100msec or more.

8.1.2.13.
AUTOSET,
MANUALSET signals

➢ Contents

AUTO mode is selected from outside by short-circuiting AUTOSET and INCOM.

MANUAL mode is selected from outside by short-circuiting MANUALSET and INCOM.

➢ Conditions

1. EXE mode SELECT becomes valid at READY status.
2. EXE mode SELECT is to be changed from any mode. However, in the following case, it is not to be changed.
   • While editing the program under EDIT mode.
   • While setting the parameter under PARAM mode.
3. EXE mode is to be selected only by inputting any mode. When both modes are inputted,   Err.219   EXT MODE SEL ERR   occurs.
4. The mode just after INPUT OFF of EXE mode SELECT is returned to the mode just before INPUT ON.
5. In EXE mode SELECT INPUT ON, panel mode is not selected.

8.2.   Output signals

Output signal from external terminal is divided into two kinds.

- ➢ Output signal from rotary table
- ➢ Output signal from external terminal.

8.2.1.
OUTPUT signals
（for rotary table）

MAC mini iH / iHF / iHP

No.	Name	Signal	Description
1	Brake OUTPUT	BK+1	Power (DC24V) for brake operation is
2	Brake OUTPUT	BK-1	supplied.

MAC mini iH2 / iHT   2-axis controller

Axis	No.	Name	Signal	Description
A-axis	1	Brake OUTPUT	BK+1	Power (DC24V) for brake of A-axis is supplied.
	2	Brake OUTPUT	BK-1	
B-axis	1	Brake OUTPUT	BK+2	Power (DC24V) for brake of B-axis is supplied.
	2	Brake OUTPUT	BK-2	

For these INPUT signals, an exclusive cable (CB1i) is routed to connect the controller and the rotary table.

8.2.1.1.
BK Signal

- ➢ Contents

  In UNCLAMP, power DC24V is outputted between BK+ and BK-.

  BK+ is   pole and BK- is   pole.

  When setting PRM032=1, power DC24V is usually outputted to this cable line.

  BK+1 and BK-1 are for A-axis (single) and BK+2 and BK-2 are B-axis.

8.2.2.
Output signals
(for EXE)

The following list shows OUTPUT signals for the controller.

These OUTPUT signals are transmitted through CB3i cable.

Type	No.	Name	Signal	Description
COM.	1	BLOCK FIN	BLKFIN	When 1 block motion of program RUN is finished during AUTO mode, BLKFIN is outputted. Also, when external channel is changed, it is outputted for checking.
	2	BLOCK FIN COMMON	BLKFINCOM	This is private output common mode of BLKFIN.
	3	OPTION FIN	G99FIN1	When the program of G98 G99 or G21L99 is executed, G99FIN1 is outputted. In G98, this signal is outputted together with BLK FIN. In G99, BLK FIN is not outputted.
	4	360°FIN	360FIN1	During PRM25 0 One shot output type , when the table passes through WZERO position or stops at its place, 360FIN1 is outputted for the time set to PRM036. During PRM025=1 Continuous output type , when the circular table shifts in the area set to PRM026, this signal is outputted. The signal is continuously outputted while the circular table is in the area.
	5	ZERO RETURN FINISH	ZRNFIN1	When MZRN is finished, this signal is outputted.
	6	ALARM OUTPUT A-CONTACT	ALMOUTA	When alarm occurs, the signal that A-contact is closed is outputted.
	7	ALARM OUTPUT B-CONTACT	ALMOUTB	When alarm occurs, the signal that B-contact is opened is outputted.
	8	CHANNEL NO. OUTPUT	CHOUT0	Channel number while selecting currently is outputted by binary.
	9		CHOUT1	
	10		CHOUT2	
	11		CHOUT3	
	12		CHOUT4	
	13		CHOUT5	
	14		CHOUT6	
	15	OUTPUT COMMON 1	OUTCOM1	Common line of No.3 14
iH2 iHT	16	OPTION FIN2	G99FIN2	Content is the same as above G99FIN1. However, this code is outputted for B-axis.
	17	360°FIN2	360FIN2	Content is the same as above 360FIN1. However, this code is outputted for B-axis.
	18	ZERO RETURN FIN2	ZRNFIN2	Content is the same as above ZRNFIN1. However, this code is outputted for B-axis.
	19	OUTPUT COMMON 2	OUTCOM2	Common line of No.16 18
COM.	20	EMG STOP OUTPUT	EMOUT	The EMG STOP SW mode on the panel is outputted to machine side (NC side) at B-contact state.
	21	EMG STOP OUTPUT COMMON	EMOUTCOM	This is output common for EMOUT.

Common types are MAC mini iH / iHF / iHP / iH2 / iHT .

8.2.2.1.
BLKFIN signal

➢ Contents

The contact between BLKFIN and BLKFINCOM is closed <u>in</u>
<u>BLKFIN</u> of program run (AUTO mode).

The exception shown below is outputted when the program is
executed.

- OUTPUT timing in G07 outputted when program is started.
- OUTPUT timing in G08, 09 outputted when G08 is executed
  started .

The output time is from BLKFIN to ST signal OFF check
(PRM035=0) or the time set to PRM035.

When the external channel is selected during the binary mode, this
signal is outputted for checking the channel change.

When the external channel is selected during M-signal mode, this
signal is outputted for checking the following signals.

- ZERO signal   CHSEL0-INCOM
- PLUS1 signal   CHSEL1-INCOM
- PLUS10 signal   CHSEL2-INCOM
- MINUS10 signal   CHSEL3-INCOM

In the MAC mini iH2 series 2-axis spec. , when there are execution
commands for both axes into one block, the BLKFIN is outputted after
executing both axes.

For the timing chart of BLKFIN, see various timing charts as shown in the
latter section.

**8.2.2.2.
G99FIN signal**

➤ Contents

When program G99 is executed, the contact between G99FIN and OUTCOM is closed.

When program G98 is executed, this signal is outputted together with BLKFIN signal.

When program G21 L99 is executed, G99FIN is outputted.

The output times of the above   are fixed to 500msec.
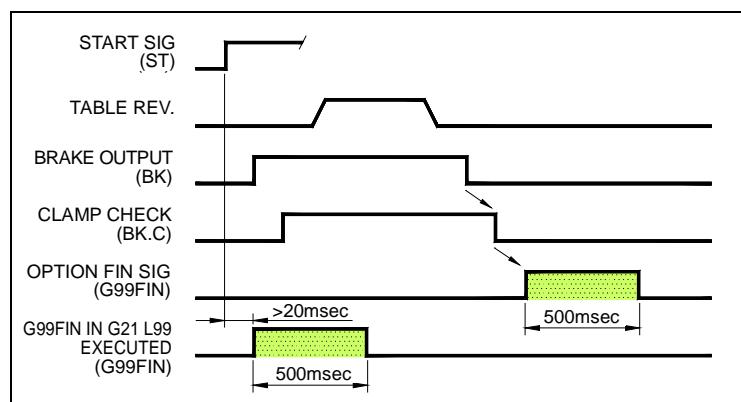
The output time in PRM029=2(G99 check signal) is PRM028.
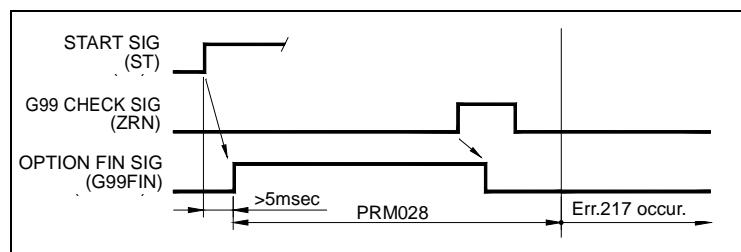
When set to PRM018=2, G99FIN is continuously outputted while BK is being outputted because it is different from the usual G99FIN output.
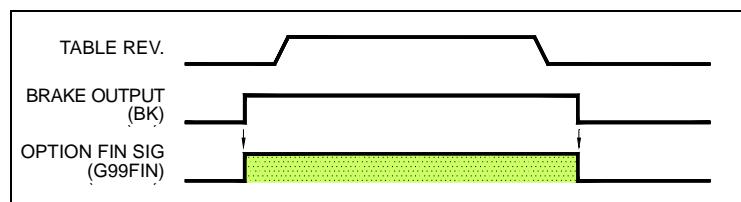
G99FIN1 is for A-axis (single axis) and G99FIN2 is for B-axis. G99FIN2 is for exclusive MAC mini iH2.

8.2.2.3.
360FIN signal

➢ Contents

In case of PRM025=0, when the table passes through WZERO position or stops at its place, this signal is outputted from the connection between 360FIN and OUTCOM.

The output contact can be changed at PRM034.

The output time of one shot type is set to PRM036.
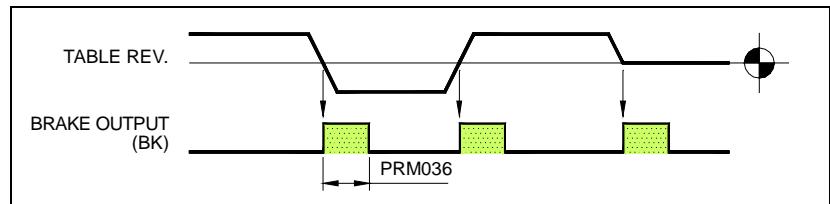
In case of PRM025=1, the output area based on WZERO is set to PRM026. When the current coordinate is in the area, this signal is continuously outputted from the connection between 360FIN and OUTCOM.
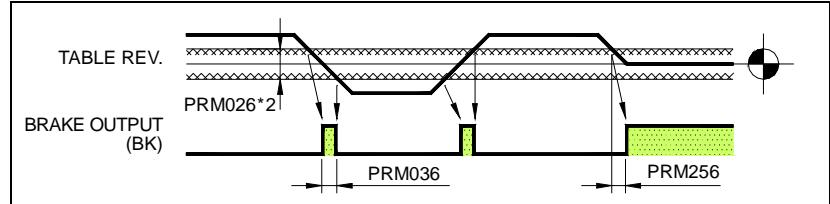
360FIN1 is for A-axis (single axis) and 360FIN2 is for B-axis. 360FIN2 is for exclusive MAC mini iH2.

8.2.2.4.
ZRNFIN signal

➢ Contents

When the motion for MZRN command is finished, the contact between ZRNFIN and OUTCOM is closed.

The output time of ZRNFIN is fixed to 500msec.

The output start timing is the same as BLKFIN.
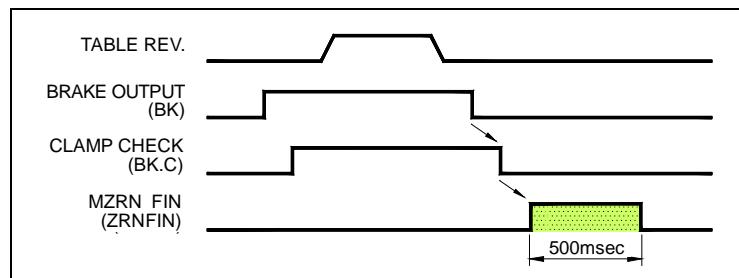
ZRNFIN1 is for A-axis (single axis) and ZRNFIN2 is for B-axis. ZRNFIN2 is for exclusive MAC mini iH2.

When G23 is commanded (only single or both) at 2-axis spec., and BLKFIN is outputted at operation finish of both axes, the axis that finished MZRN outputs ZRNFIN.

When G23 is commanded on both axes and operation of either axis is finished backwardly.
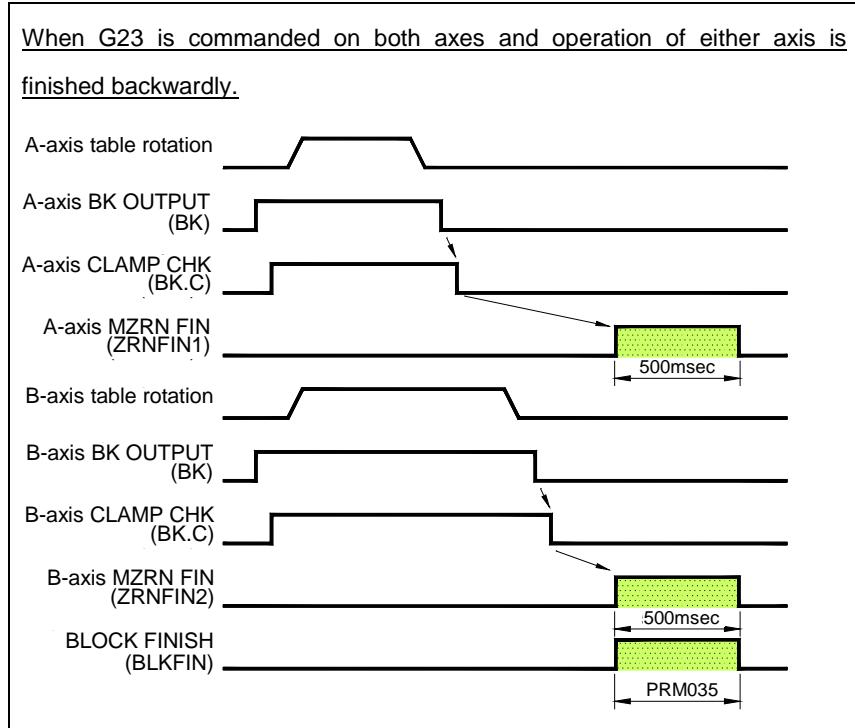
8.2.2.5.
ALMOUT Signal

➢ Contents

When the STATUS of controller is in alarm state, this signal is outputted from the connection between ALMOUTA and OUTCOM, and connection between ALMOUTB and OUTCOM.

When any alarm occurs, the connection between ALMOUTA and OUTCOM is closed, and the connection between ALMOUTB and OUTCOM is opened.

The alarm is continuously outputted while the STATUS is in alarm.

8.2.2.6.
CHOUT Signal

➢ Contents

The channel number during selection is outputted between CHOUT0, 1, 2, 3, 4, 5, 6 and OUTCOM by binary.

Channel number OUTPUT is changed simultaneously with BLKFIN OUTPUT for checking channel change.

8.2.2.7.
EMOUT signal

➢ Contents

The contact of emergency stop button of controller is outputted from the connection between EMOUT and EMOUTCOM.

Since EMOUT is B-contact spec., the contact is closed in normal and it is opened when the emergency stop button is pushed.

8.3.   Signal timing in program

8.3.1.
General programs   The basic time chart from the program start to operation finish is shown in the following figure.
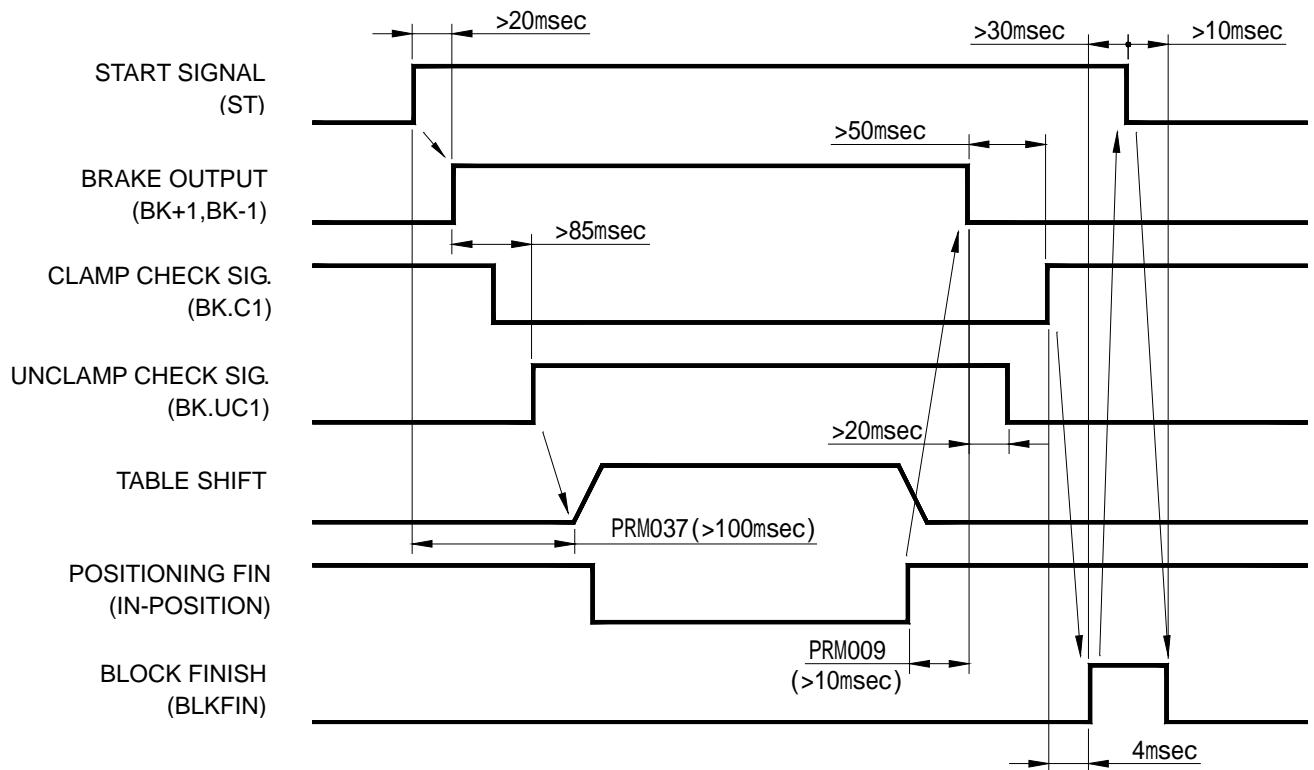
Operation steps

    ST INPUT ON

    Brake OUTPUT ON   UNCLAMPED

        CLAMP CHECK: OFF   UNCLAMP CHECK: ON

    Rotation is started by checking UNCLAMP.

    Entered in in-position by indexing.

    Brake OUTPUT OFF after PRM009 time (CLAMPED)

        CLAMP CHECK: ON   UNCLAMP OUTPUT: OFF

    BLKFIN OUTPUT ON at CLAMP CHECK ON

    ST signal OFF at BLKFIN OUTPUT ON CHECK

    BLKFIN OFF at ST INPUT OFF CHECK

        BLKFIN is remained until ST INPUT is OFF.

Though ST signal can be inputted at one shot, use the ST signal that is OFF at BLKFIN ON CHECK for preventing errors.

KITAGAWA   **C8-15**

8.3.2
HOLD Time chart

The basic time chart from the program start to operation finish is shown in the following figure.

It is necessary to return SP to ON state before ST input in restart.

Program is not restarted unless checking ST signal start.
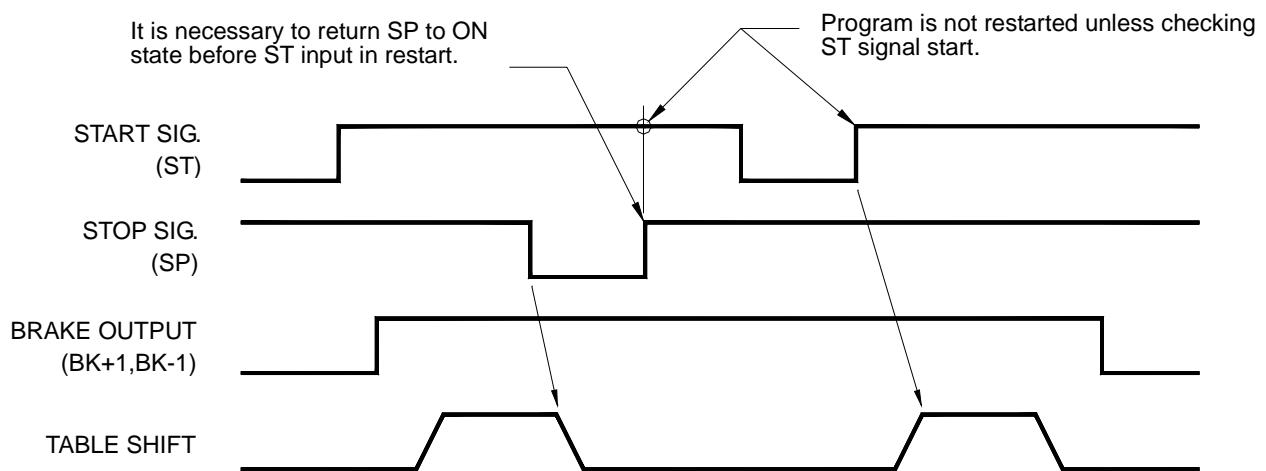
8.3.3.
G08,G09
Time chart

When using G08, G09, BLKFIN OUTPUT timing can be changed by PRM020.

PRM020=0
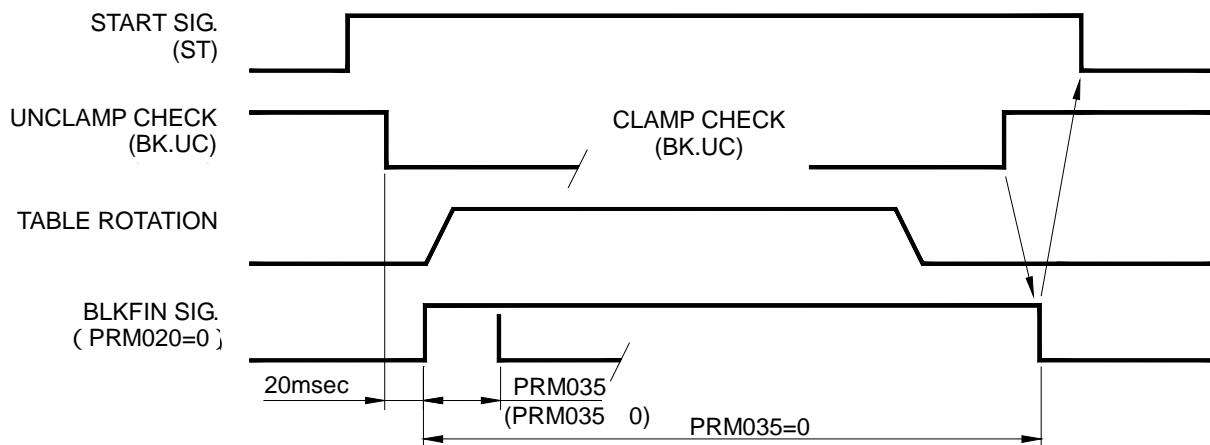
PRM020=1
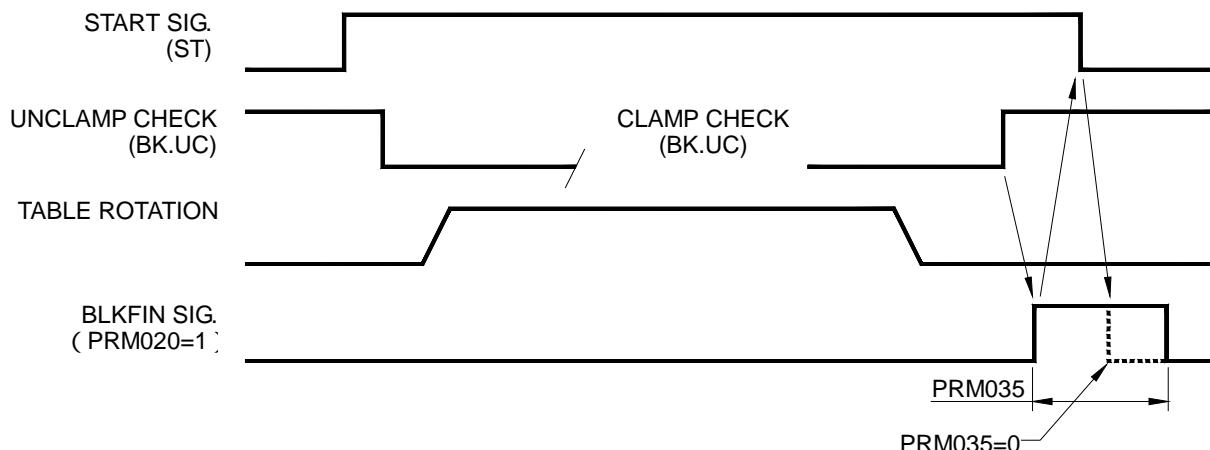
8.3.4.
G07 Time chart   When using G07, BLKFIN OUTPUT timing can be changed by PRM021.

PRM021=0

START SIG.
(ST)

UNCLAMP CHECK   CLAMP CHECK
(BK.UC)   (BK.UC)

TABLE ROTATION

BLKFIN SIG.
PRM021=0

20msec   PRM035
(PRM035 0)   PRM035=0

PRM020=1

START SIG.
(ST)

UNCLAMP CHECK   CLAMP CHECK
(BK.UC)   (BK.UC)

TABLE ROTATION

BLKFIN SIG.
PRM021=1

PRM035

PRM035=0
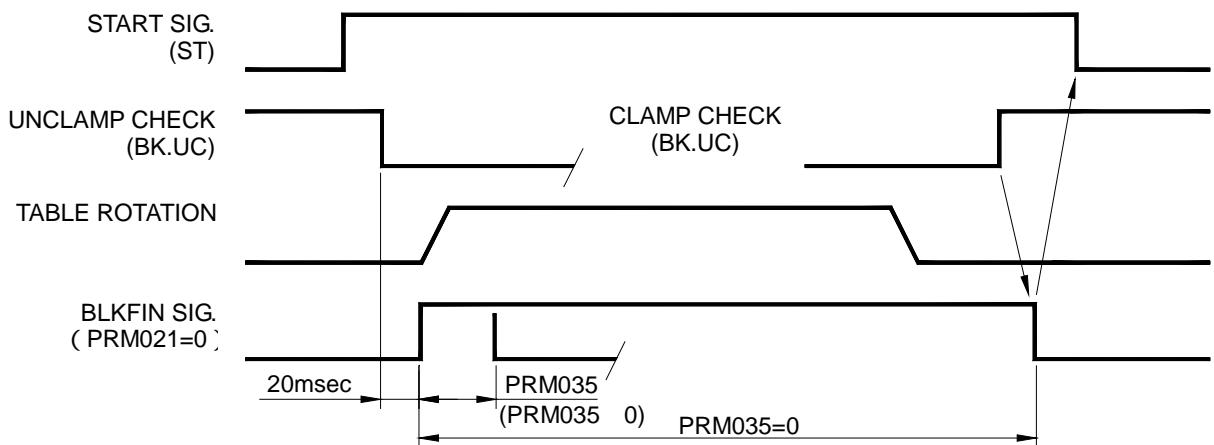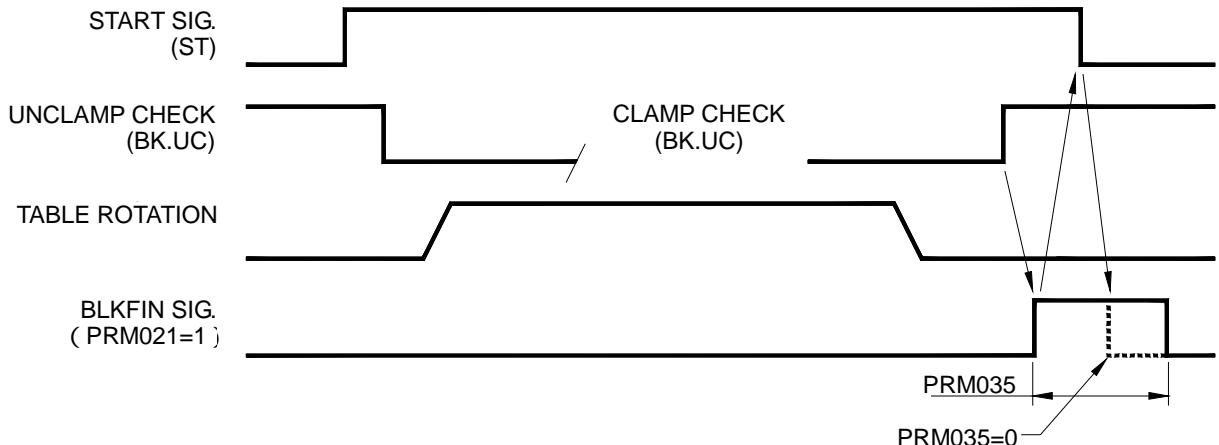
8.3.5.
G21 Time chart   In machine interlock of G21, it is very difficult to adjust the timing with the machine. Therefore, it is necessary to be synchronized simply by setting the following time.

      Since this controller is synchronized with the machine by an external signal, a complete synchronization is impossible.

START SIG.
(ST)

>5msec

BRAKE OUTPUT
(BK)

TABLE ROTATION

BLKFIN SIG.
BLKFIN

PRM047

PRM043   PRM035
(However, PRM042=1)   PRM035 0
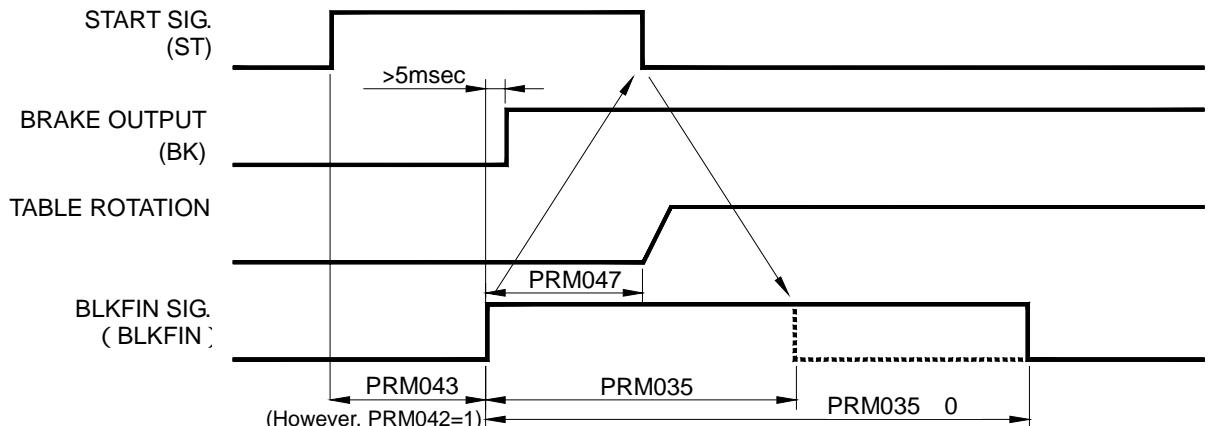
**8.3.6.
BLKFIN
Time chart**

In the timing outputted when BLKFIN signal is finished, object contents can be changed by setting the parameter.

The object contents include CLAMP CHECK signal, UNCLAMP CHECK signal and position deviation.

The following shows the timing by this combination.

CLAMP CHECK TYPE

PRM022=0   PRM038=1   (PRM032=0)   Standard setting
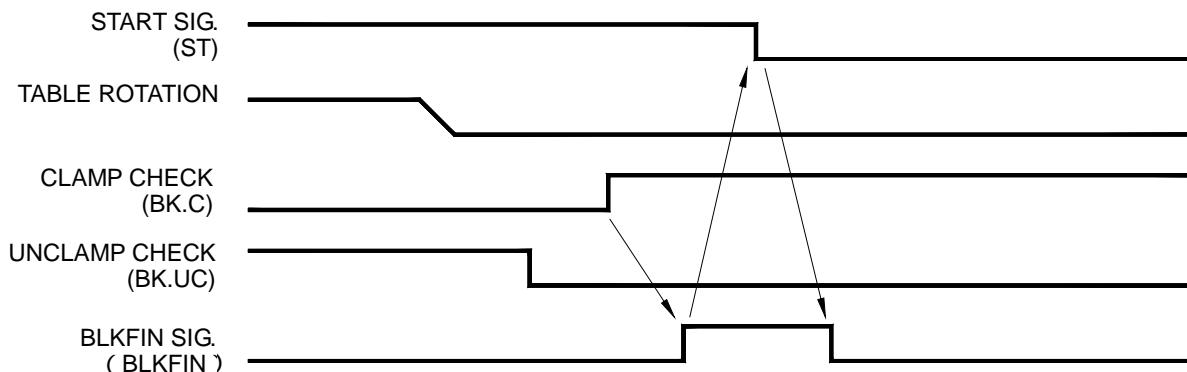
UNCLAMP CHECK TYPE

PRM022=0   PRM038=0   (PRM032=0)

Shortened to this time shorter than CLAMP CHK time.
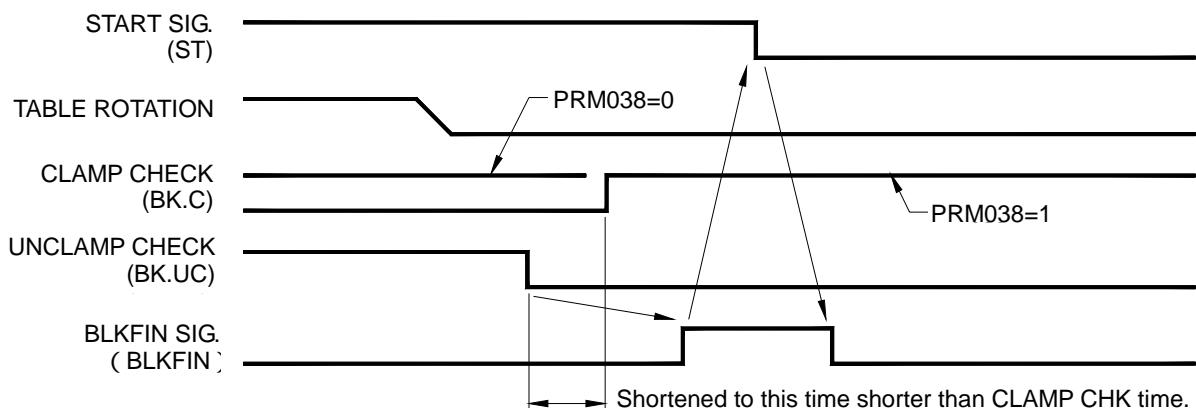
POS. DEVIATION CHECK TYPE

PRM022=1   or   PRM032=1

Shortened to this time shorter than CLAMP CHECK time (Standard time).
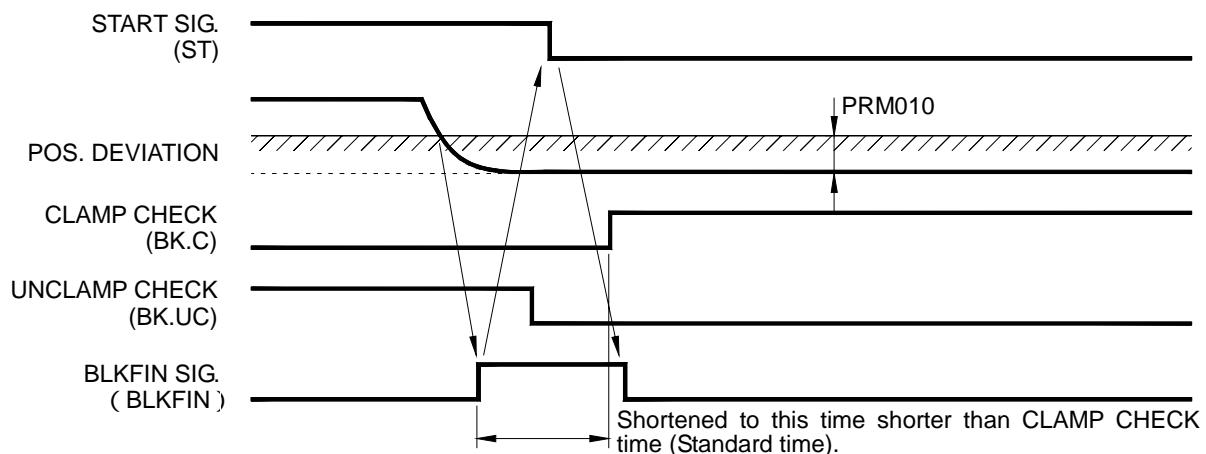
8.4.   EXE I/O SPEC. LIST

NO.	Signal name	I/O	Type	Spec.	Remarks
1	ST	I	Dry or Tr	DC24V 10mA	
2	SP	I	Dry or Tr	DC24V 10mA	
3	EXT.EM	I	Dry or Tr	DC24V 10mA	
4	CHSEL0	I	Dry or Tr	DC24V 10mA	
5	CHSEL1	I	Dry or Tr	DC24V 10mA	
6	CHSEL2	I	Dry or Tr	DC24V 10mA	
7	CHSEL3	I	Dry or Tr	DC24V 10mA	
8	CHSET	I	Dry or Tr	DC24V 10mA	
9	RST	I	Dry or Tr	DC24V 10mA	
10	ZRN1	I	Dry or Tr	DC24V 10mA	
11	AUTOSET	I	Dry or Tr	DC24V 10mA	
12	MANUALSET	I	Dry or Tr	DC24V 10mA	
13	BLKFIN	O	Dry	DC30V 0.4A	Min. DC5V 100mA
14	G99FIN1	O	Dry	DC30V 0.4A	Min. DC10mV 10μA
15	360FIN1	O	Dry	DC30V 0.4A	Min. DC10mV 10μA
16	ZRNFIN1	O	Dry	DC30V 0.4A	Min. DC10mV 10μA
17	ALMOUTA	O	Dry	DC30V 0.4A	Min. DC10mV 10μA
18	ALMOUTB	O	Dry	DC30V 0.4A	Min. DC10mV 10μA
19	CHOUT0	O	Dry	DC30V 0.4A	Min. DC10mV 10μA
20	CHOUT1	O	Dry	DC30V 0.4A	Min. DC10mV 10μA
21	CHOUT2	O	Dry	DC30V 0.4A	Min. DC10mV 10μA
22	CHOUT3	O	Dry	DC30V 0.4A	Min. DC10mV 10μA
23	CHOUT4	O	Dry	DC30V 0.4A	Min. DC10mV 10μA
24	CHOUT5	O	Dry	DC30V 0.4A	Min. DC10mV 10μA
25	CHOUT6	O	Dry	DC30V 0.4A	Min. DC10mV 10μA
26	EMOUT	O	Dry	600V 10A	Min. AC/DC3V 5mA
27	ZRN2	I	Dry or Tr	DC24V 10mA	
28	G99FIN2	O	Dry	DC30V 0.4A	Min. DC10mV 10μA
29	360FIN2	O	Dry	DC30V 0.4A	Min. DC10mV 10μA
30	ZRNFIN2	O	Dry	DC30V 0.4A	Min. DC10mV 10μA

The marking part in the above columns shows the additional spec., data for MAC mini iH2 / iHT. MAC mini iH / iHF / iHP have not spec., data.

9.   I/O Signal Format

9.1.   Input format

9.1.1
Input format
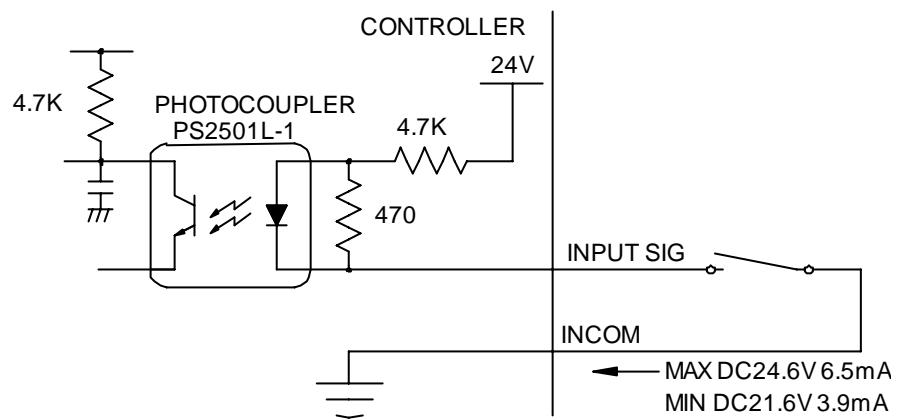
Electrical specifications for the contact connected as the input signal are as follows:

Rated	DC30V,10mA
Minimum switching current	DC24V,3mA or less
Leakage current in OFF	0.5mA or less

9.2. Output format

9.2.1.
Output format

OUTCOM1 is routed as common wiring as shown in diagram.
OUTCOM2 is output common wiring for exclusive B-axis.

Only MAC mini
iH2 / iHT
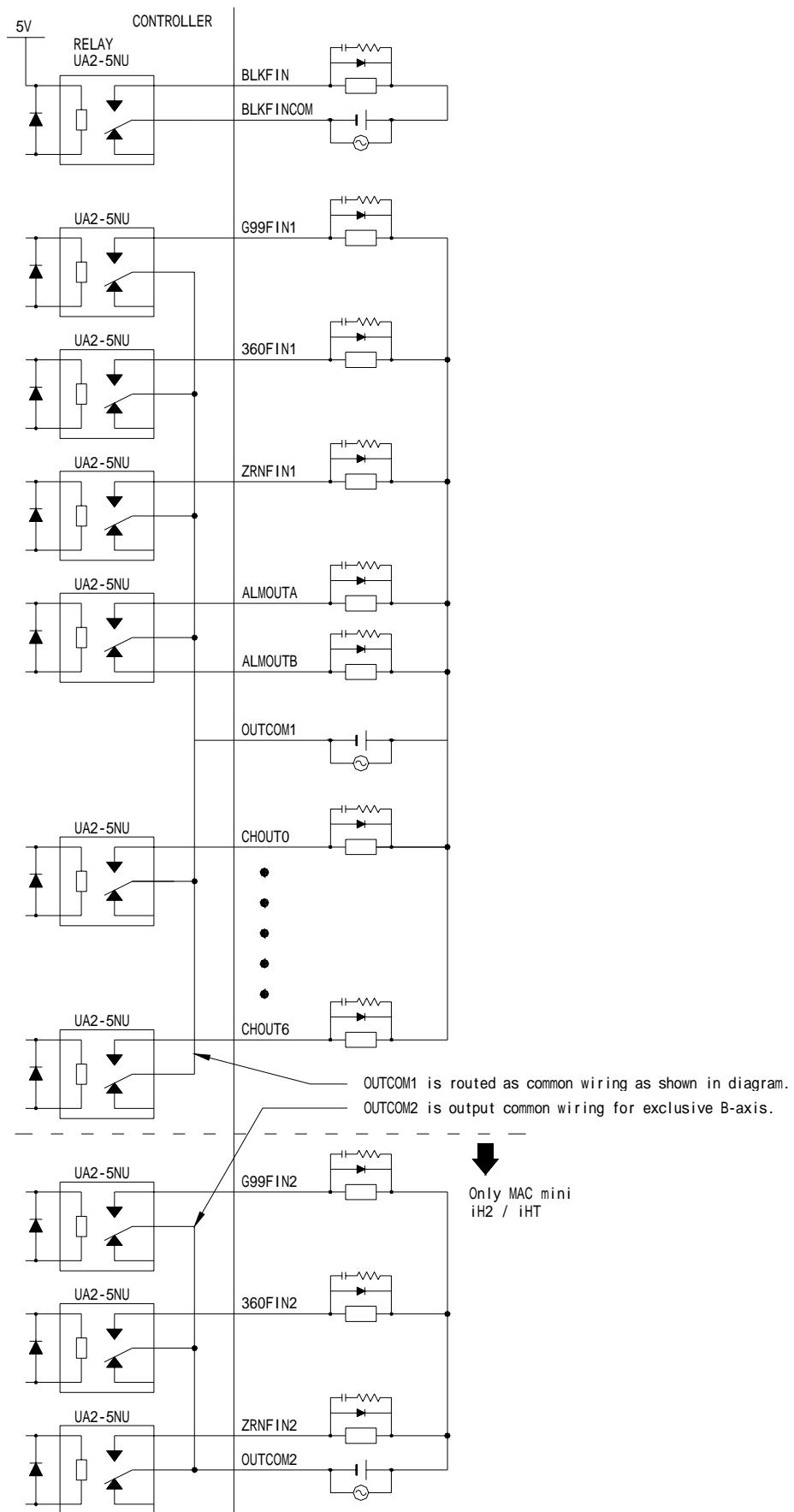
The electric specifications for output contact are within values specified to PELV (Protection Ultra Low Voltage) and the following specifications are to be observed.

Max. switching voltage	25V ACrms / 30V DC
Max. switching current	1A
Max. switching capacity	DC24W, AC25VA
Min. applicable load	DC1V 1mA

9.2.2 Output format for clamp
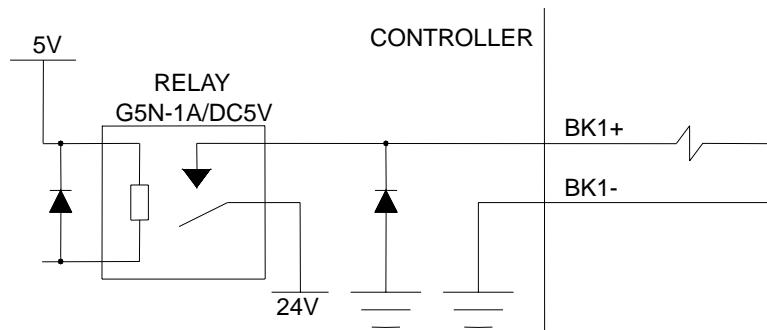
Clamp output specification

Output rating	DC24V ± 10 0.5A

9.2.3. Emergency stop output format
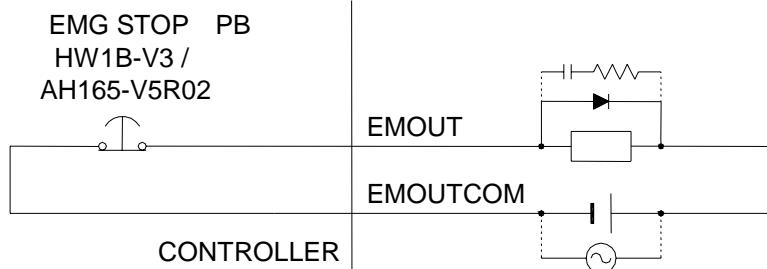
Contact specifications for emergency stop push button

Rated insulation voltage	600V
Rated current	10A
Min. applicable load	AC/DC3V 5mA

9.3.　　Precautions using I/O circuit

When the load connected to the output mode is an inductive load, it is possible to reduce noise by providing the serge killer such as diode, barrister, CR, etc.

➢ When the power used for the inductive load is DC (Direct Current), use the serge killer of diode type (Fig. A).

➢ When the power used for the inductive load is AC (Alternating Current), use the serge killer of CR type (Fig. B).

※ Unless the serge killer is inserted, the service life of contact is shortened or noise occurs. Be sure to insert the serge killer so as not to cause malfunction or damage.

(A) Protection by diode   (B) Protection by CR

Use electric apparatuses within rated range.

10. Detailed External Connection CB3i cable

10.1. MAC mini iH / iHF / iHP type

IN CONTROLLER PANEL

NC1 PIN NO.

Description	Label	Pin
BLOCK FINISH	BLKFIN	1
BLOCK FINISH COMMON	BLKFINCOM	2
OPT FINISH 1	G99FIN1	3
360° OUTPUT 1	360FIN1	4
ALARM A-CONTACT OUTPUT	ALMOUTA	5
ALARM B-CONTACT OUTPUT	ALMOUTB	6
ZRN FINISH 1	ZRNFIN1	7
OUTPUT COMMON	OUTCOM	8
STOP	SP	9
START	ST	10
CHANNEL SELECT 0	CHSEL0	11
CHANNEL SELECT 1	CHSEL1	12
CHANNEL SELECT 2	CHSEL2	13
CHANNEL SELECT 3	CHSEL3	14
CHANNEL SET	CHSET	15
EXT EMG STOP INPUT	EXTEM	16
INPUT COMMON	INCOM	17
INPUT COMMON	INCOM	18
EMG STOP OUTPUT	EMOUT	19
EMG STOP OUTPUT COMMON	EMOUTCOM	20

NCOP1 PIN NO.

Description	Label	Pin
EXE RESET	RST	1
EXE ZRN REQUEST	ZRN1	2
EXE ZRN REQUEST 2	ZRN2	3
EXE MANU MODE SEL	MANUALSET	4
EXE AUTO MODE SEL	AUTOSET	5
CH NO OUTPUT 0	CHOUT0	6
CH NO OUTPUT 1	CHOUT1	7
CH NO OUTPUT 2	CHOUT2	8
CH NO OUTPUT 3	CHOUT3	9
CH NO OUTPUT 4	CHOUT4	10
CH NO OUTPUT 5	CHOUT5	11
CH NO OUTPUT 6	CHOUT6	12
		13
		14
OUTPUT COMMON	OUTCOM	15

10.2.   MAC mini iH2 / iHT type

IN CONTROLLER PANEL

NC2 PIN NO.

BLOCK FINISH	BLKFIN	1
BLOCK FINISH COMMON	BLKFINCOM	2
OPT FINISH 1	G99FIN1	3
360° OUTPUT 1	360FIN1	4
ALARM A-CONTACT OUTPUT	ALMOUTA	5
ALARM B-CONTACT OUTPUT	ALMOUTB	6
ZRN FINISH 1	ZRNFIN1	7
OUTPUT COMMON	OUTCOM	8
STOP	SP	9
START	ST	10
CHANNEL SELECT 0	CHSEL0	11
CHANNEL SELECT 1	CHSEL1	12
CHANNEL SELECT 2	CHSEL2	13
CHANNEL SELECT 3	CHSEL3	14
CHANNEL SET	CHSET	15
EXT EMG STOP INPUT	EXTEM	16
INPUT COMMON	INCOM	17
INPUT COMMON	INCOM	18
EMG STOP OUTPUT	EMOUT	19
EMG STOP OUTPUT COMMON	EMOUTCOM	20

NCOP1 PIN NO.

EXE RESET	RST	1
EXE ZRN REQUEST	ZRN1	2
EXE ZRN REQUEST 2	ZRN2	3
EXE MANU MODE SEL	MANUALSET	4
EXE AUTO MODE SEL	AUTOSET	5
CH NO OUTPUT 0	CHOUT0	6
CH NO OUTPUT 1	CHOUT1	7
CH NO OUTPUT 2	CHOUT2	8
CH NO OUTPUT 3	CHOUT3	9
CH NO OUTPUT 4	CHOUT4	10
CH NO OUTPUT 5	CHOUT5	11
CH NO OUTPUT 6	CHOUT6	12
		13
		14
OUTPUT COMMON	OUTCOM	15

NC2 PIN NO.

G99FIN2	G99FIN2	1
360° OUTPUT2	360FIN2	2
ZRNFIN2	ZRNFIN2	3
OUTPUT COMMON 2	OUTCOM2	4

11   RS232C Connection

11.1.   Detailed RS232C connector

The following shows the detailed RS232C connector installed on the controller.

| Pin No.	Signal Name	Description	I/O
1	CD	Carrier detection	OUTPUT
2	RD	Receiving data	INPUT
3	SD	Transmitting data	OUTPUT
4	ER	Ready on controller	OUTPUT
5	SG	Grounding for signal	
6	DR	Data setting ready	INPUT
7	RS	Transmitting request (Signal showing communicability to external equipment.	OUTPUT
8	CS	Transmittable Signal permitting transmission from external equipment.	INPUT
9			

11.2.   Detailed RS232C cable wiring

Two types of 25-pin type and 9-pin type are described on the external equipment side for cables.
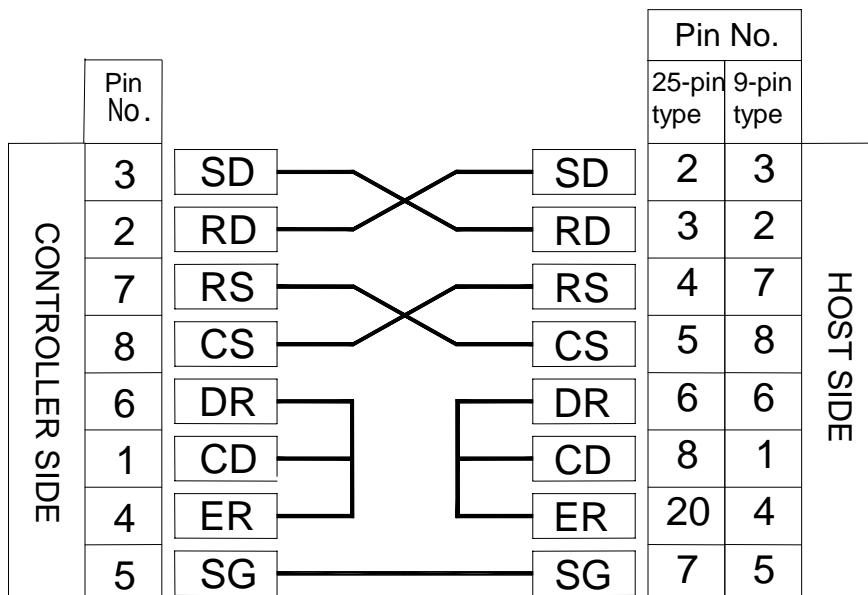
If communication fails because of noise, etc., disconnect either SG cable.

12   Connection to Machine

12.1.   Machine connection wiring

The system receives and transmits the start signal (M-signal) and 1 block finish signal from/to the external equipment.

In addition to the above, since the following signals can be communicated, be sure to route the cables for their signals.

★ START   ST
The program is executed by this signal during "AUTO" or "SINGLE" mode.

★ STOP   SP
Though this signal is used as a temporary stop signal of program, since SP signal is B-contact specification even if this function is not used, it is necessary to be short-circuited with INCOM line.

★ EXTERNAL EMERGENCY STOP   EXTEM
This signal is used for inputting the emergency stop from the external equipment.

★ INPUT COMMON   INCOM
This the common line for an input signal.

★ 1 BLOCK FINISH   BLKFIN
This signal is outputted when 1 block motion is finished during "AUTO" mode.

★ 1 BLOCK FINISH COMMON   BLKFINCOM
This is the common for 1 block finish output signal.

★ ALARM OUTPUT B   ALMOUTB
This is for issuing the alarm signal on the circular table side.

★ OUTPUT COMMON   OUTCOM
This is the common for output signal.

★ EMERGENCY STOP OUTPUT   EMOUT
This is for outputting the emergency stop button state of controller.

★ EMERGENCY STOP OUTPUT COMMON   EMOUTCOM
This is the common for emergency stop output signal.

12.2.   Machine connecting example
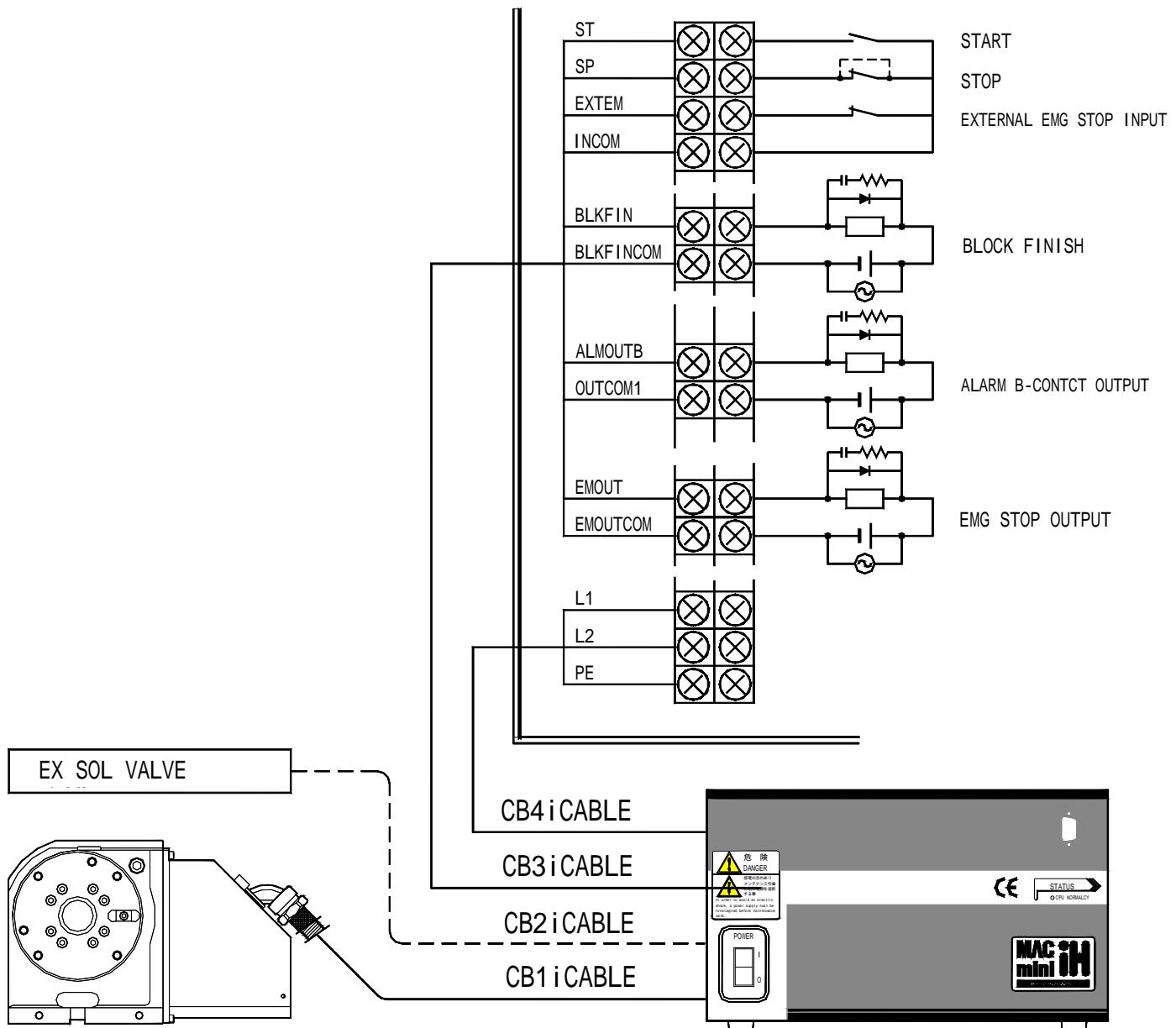
> Input B-contact for SP signal. When the SP signal is not used, short-circuit the connection between SP and INCOM.

> When the external emergency stop mode is inputted, input EXTEM signal at B-contact.

When these two input signals are not turned ON, the program does not run.

13   Block Diagram

13.1.   MAC mini iH / iHF   Block diagram
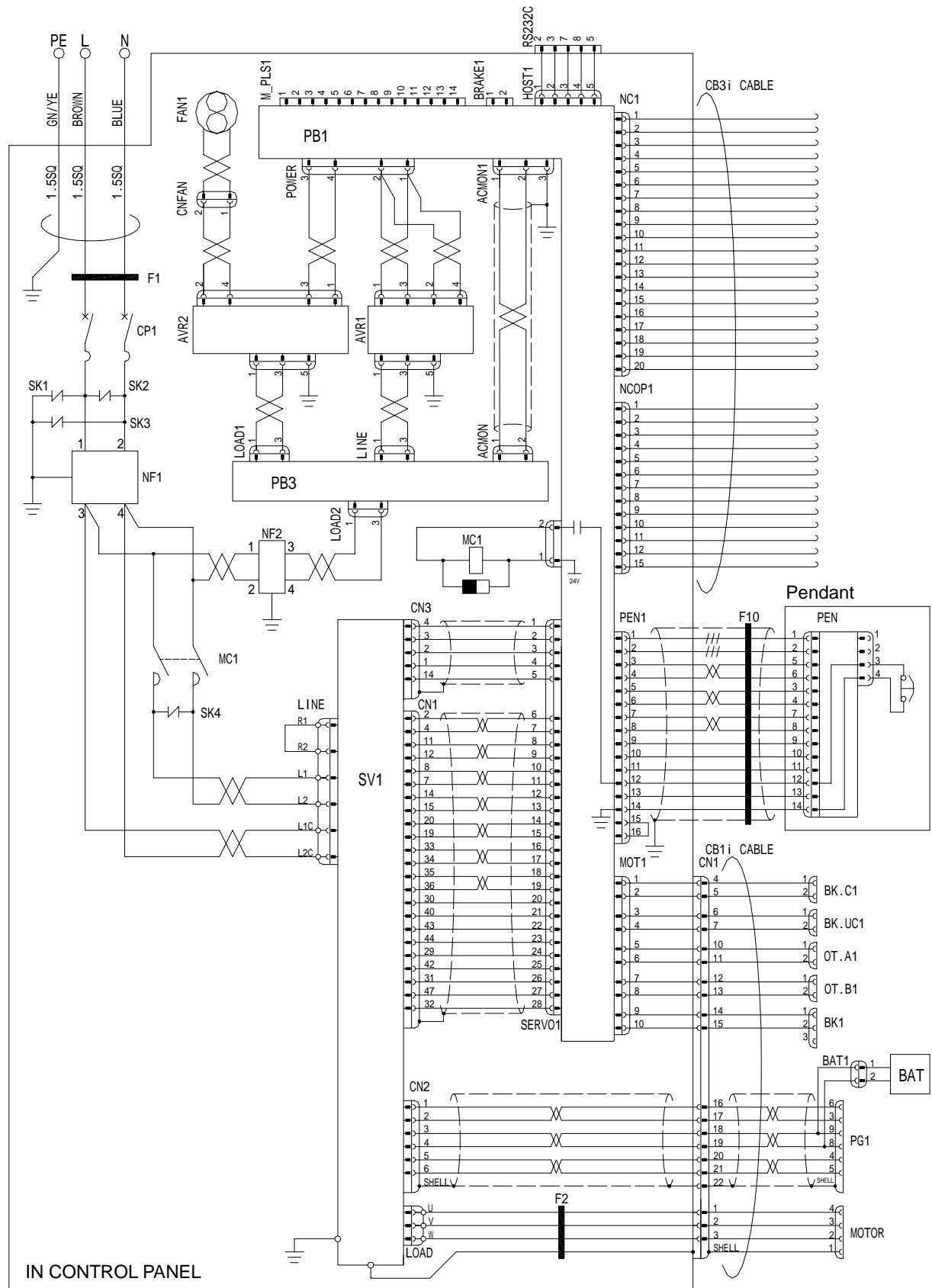
13.2.   MAC mini iH2 / iHT   Block diagram

IN CONTROL PANEL
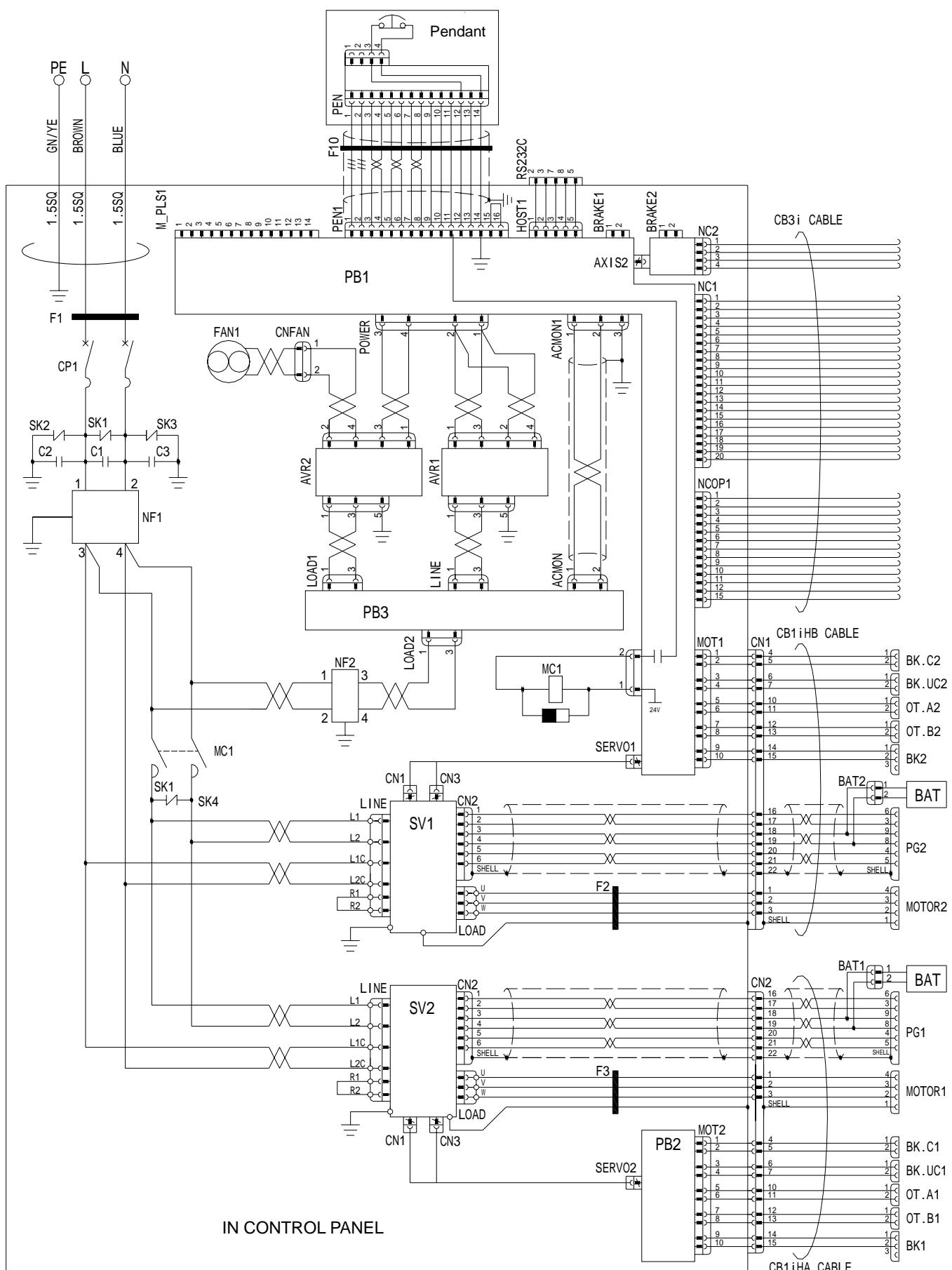
PARTS LIST

C o n t e n t s

1   MAC mini iH / iHF   Parts List

1.1.   Arrangement view

Viewed from A-face

Viewed from back face

Viewed from upper face

Viewed from front face
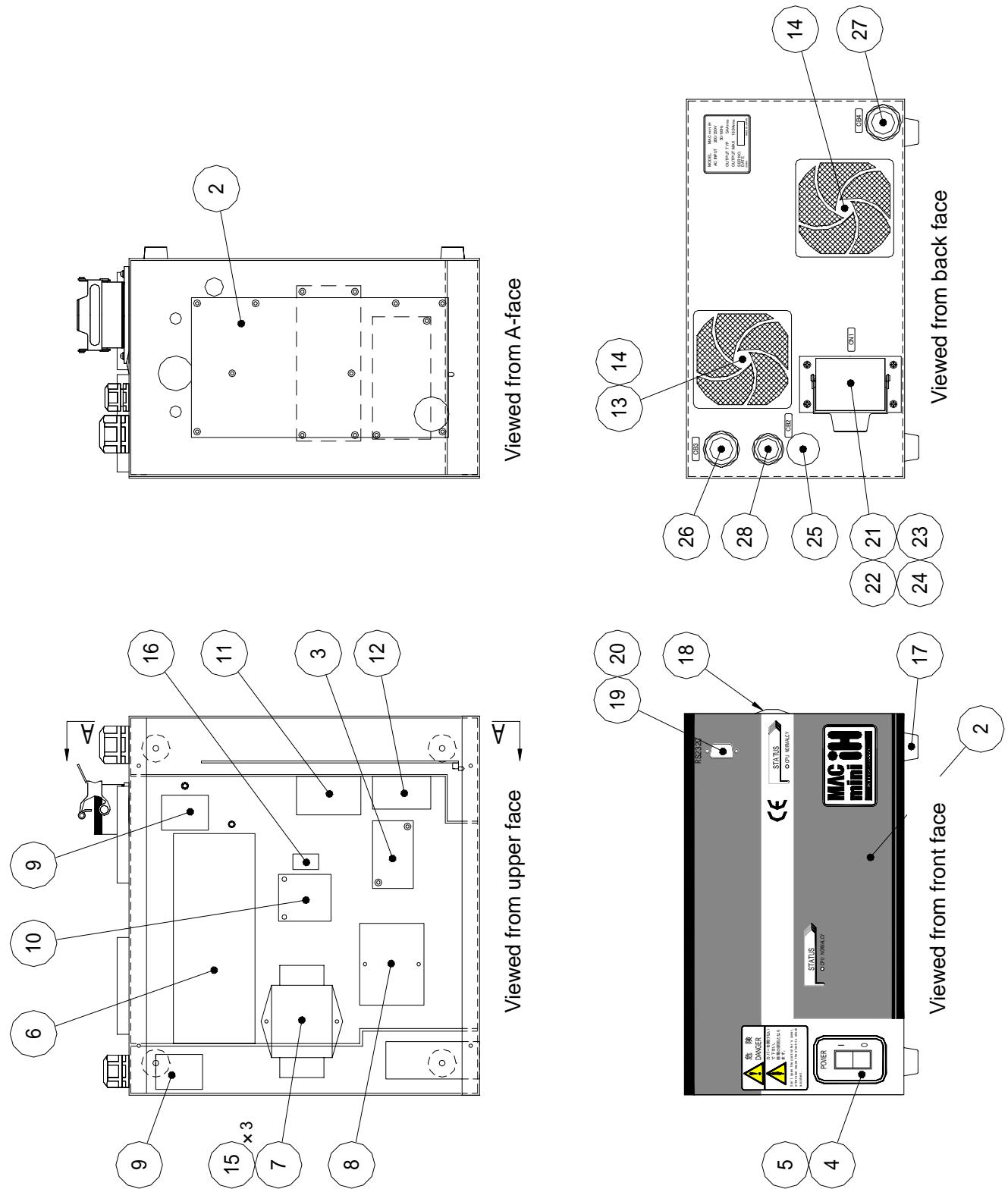
1.2. Controller unit

| NO.	Code	Parts Name	Type	Maker	Q'ty	Remarks
1	PDT	Pendant		KITAGAWA	1	
2	PB1	Control substrate	PB001-H001B	KITAGAWA	1	
3	PB3	Control substrate	PB008-H001-A	KITAGAWA	1	
4	CP1	Circuit protector	CP22RM/5-B1	FUJI DENKI	1	MAC mini iHF
			CP22RM/10-B1	FUJI DENKI		MAC mini iH
5		CP1 cover	136029-J020-A	KITAGAWA	1	
6	SV1	Servo amplifier	SGDS-04A01A	YASKAWA	1	MAC mini iHF
			SGDS-08A01A	YASKAWA		MAC mini iH
7	NF1	Nozzle filter	MBS-1210-22	DENSEI-LAMBDA	1	
8	NF2	Nozzle filter	MBW-1203-22	DENSEI-LAMBDA	1	
9	F1 , F2	Ferrite core	ZCAT3035-1330	TDK	2	
10	MC1	Magnet conductor	SJ-0G DC24V 1a	FUJI DENKI	1	
11	AVR1	DC power AC200V/DC5V	LDA10F-5	COSEL	1	
12	AVR2	DC power AC200V/DC24V	LDA30F-10	COSEL	1	
13	FAN	Fan	PUDC24D4	NIPPON SERVO	1	
14	FAN-C	Fan cover	F-80	NIPPON SERVO	2	Renewal parts
15	SK1 SK3	Surge protection element	ENE471D-14A	FUJI DENKI	3	
16	SK4	Spark killer	RE1201	OKAYA	1	
17		Mounting legs	CP-30-FF-4A	TAKIGEN	4	
18		Mounting hole plug	OB-13	IZUMI	1	
19	RS232C	D-Sub25 connector	HDEB-9P	HIROSE	1	
20		D-Sub25 connector cover	DE-60-J2	JAPAN Aviation Electronics Industry	1	
21	CN1	CN1 housing	CZI06L	ILME JAPAN	1	
22		CN1 connector	CDDF24	ILME JAPAN	1	
23		CN1 pin	CDMF0.3	ILME JAPAN	18	
24		CN1 pin	CDFM1.0	ILME JAPAN	4	
25	CB2-C	Hole plug	CP-30-HP-10	ILME JAPAN	1	
26	CB3-C	CB3 connector	NYS5-15B	DAIWA	1	
27	CB4-C	CB4 connector	NYS5-8B	DAIWA	1	
28	K100-C	CB100 connector	NYS5-8B	DAIWA	1	

1.3. Servo motors

NO.	Code	Parts Name	Type	Maker	Q'ty	Remarks
	SVM1	Servo motor	SGMPS-04A2A6S	YASKAWA	1	MAC mini iHF
			SGMAS-08A2A6S	YASKAWA		MAC mini iH
	BAT1	Battery	JZSP-BA01	YASKAWA	1	

2   MAC mini iH2 / iHT   Parts List

2.1.   Arrangement view

Viewed from A-face

Viewed from back face

Viewed from upper face

Viewed from front face
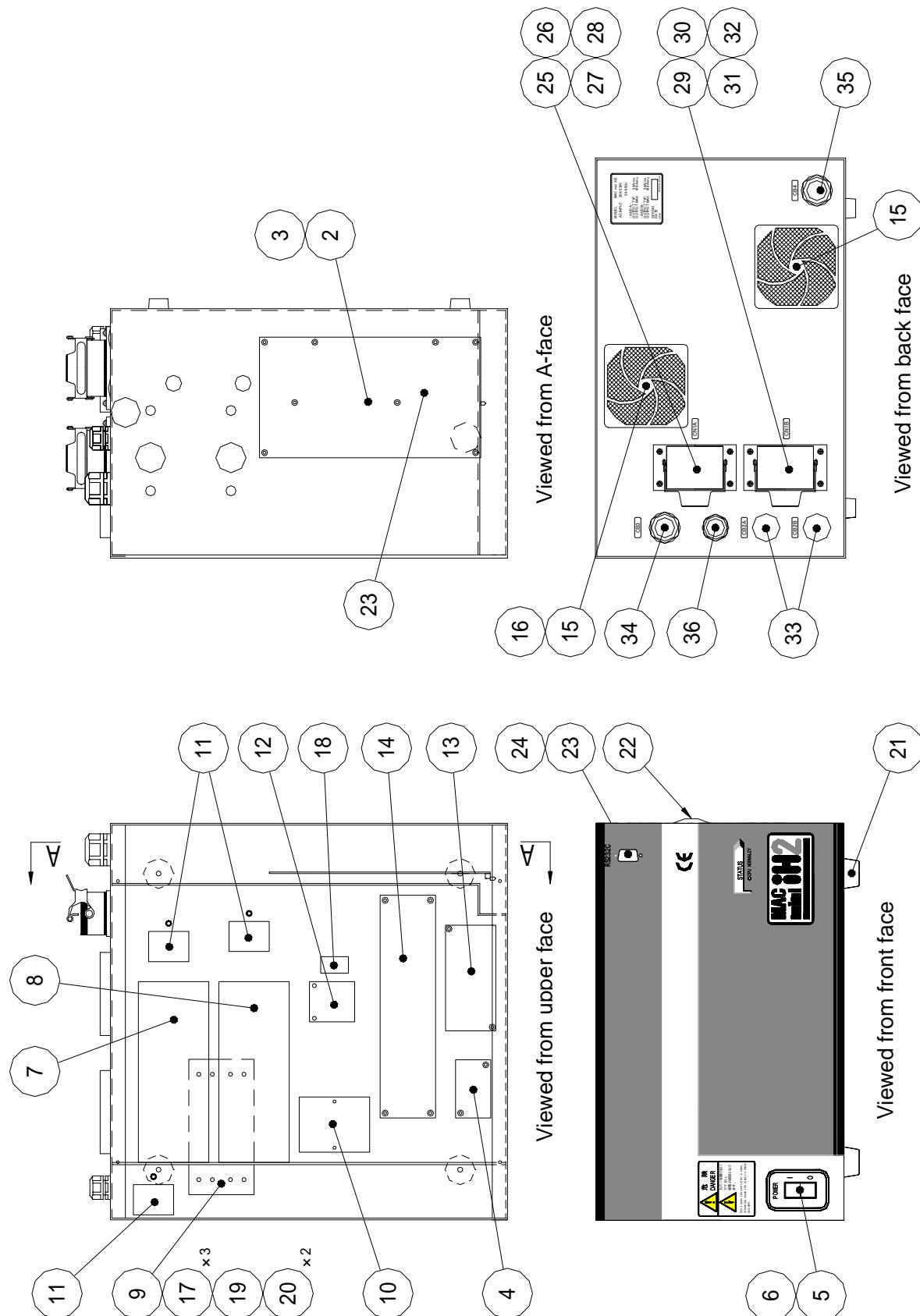
2.2.　Controller unit

NO	Code	Parts Name	Type	Maker	Q'ty	Remarks
1	PDT	Pendant		KITAGAWA	1	
2	PB1	Control substrate	PB001-H001B	KITAGAWA	1	
3	PB2	2-axis substrate	PB004-H001B	KITAGAWA	1	
4	PB3	Control substrate	PB008-H001-A	KITAGAWA	1	
5	CP1	Circuit protector	CP22RM/15-B1	FUJI DENKI	1	
6		CP1 cover	136029-J020-A	KITAGAWA	1	
7	SV1	Servo amplifier	SGDS-04A01A	YASKAWA	1	MAC mini iHT
			SGDS-08A01A	YASKAWA		MAC mini iH2
8	SV2	Servo amplifier	SGDS-08A01A	YASKAWA	1	
9	NF1	Nozzle filter	MBS-1220-22	DENSEI-LAMBDA	1	
10	NF2	Nozzle filter	MBW-1203-22	DENSEI-LAMBDA	1	
11	F1　F3	Ferrite core	ZCAT3035-1330	TDK	3	
12	MC1	Magnet conductor	SJ-0G DC24V 1a	FUJI DENKI	1	
13	AVR1	DC power AC200V/DC5V	LDA10F-5	COSEL	1	
14	AVR2	DC power AC200V/DC24V	LDA75F-10	COSEL	1	
15	FAN	Fan	PUDC24D4	NIPPON SERVO	1	
16	FAN-C	Fan cover	F-80	NIPPON SERVO	2	Renewal parts
17	SK1 SK3	Surge killer	ENE471D-14A	FUJI DENKI	3	
18	SK4	Spark killer	RE1201	OKAYA	1	
19	C1	Condenser	1μ f	TAKIGEN	1	
20	C2　C3	Condenser	0.22μ F	IZUMI	2	
21		Mounting legs	CP-30-FF-4A	TAKIGEN	4	
22		Mounting hole plug	OB-13	IZUMI	1	
23	RS232C	D-Sub25 connector	HDEB-9P	HIROSE	1	
24		D-Sub25 connector cover	DE-60-J2	JAPAN Aviation Electronics Industry	1	
25	CN1	CN1 housing	CZI06L	ILME JAPAN	1	
26		CN1 connector	CDDF24	ILME JAPAN	1	
27		CN1 pin	CDMF0.3	ILME JAPAN	18	
28		CN1 pin	CDFM1.0	ILME JAPAN	4	
29	CN2	CN2 housing	CZI06L	ILME JAPAN	1	
30		CN2 connector	CDDF24	ILME JAPAN	1	
31		CN2 pin	CDMF0.3	ILME JAPAN	18	
32		CN2 pin	CDFM1.0	ILME JAPAN	4	
33	CB2-C	Hole plug	CP-30-HP-10	TAKIGEN	2	
34	CB3-C	CB3 connector	NYS5-17B	DAIWA	1	
35	CB4-C	CB4 connector	NYS5-11B	DAIWA	1	
36	K100-C	CB100 connector	NYS5-8B	DAIWA	1	

2.3.   Servo motors

NO	Code	Parts Name	Type	Maker	Q'ty	Remarks
	SVM1	Servo motor	SGMPS-04A2A6S	YASKAWA	1	MAC mini iHT
			SGMAS-08A2A6S	YASKAWA		MAC mini iH2
	SVM2	Servo motor	SGMAS-08A2A6S	YASKAWA	1	
	BAT1	Battery	JZSP-BA01	YASKAWA	1	
	BAT2	Battery	JZSP-BA01	YASKAWA	1	

3   Pendant Parts List

3.1.   Arrangement view   A3-1
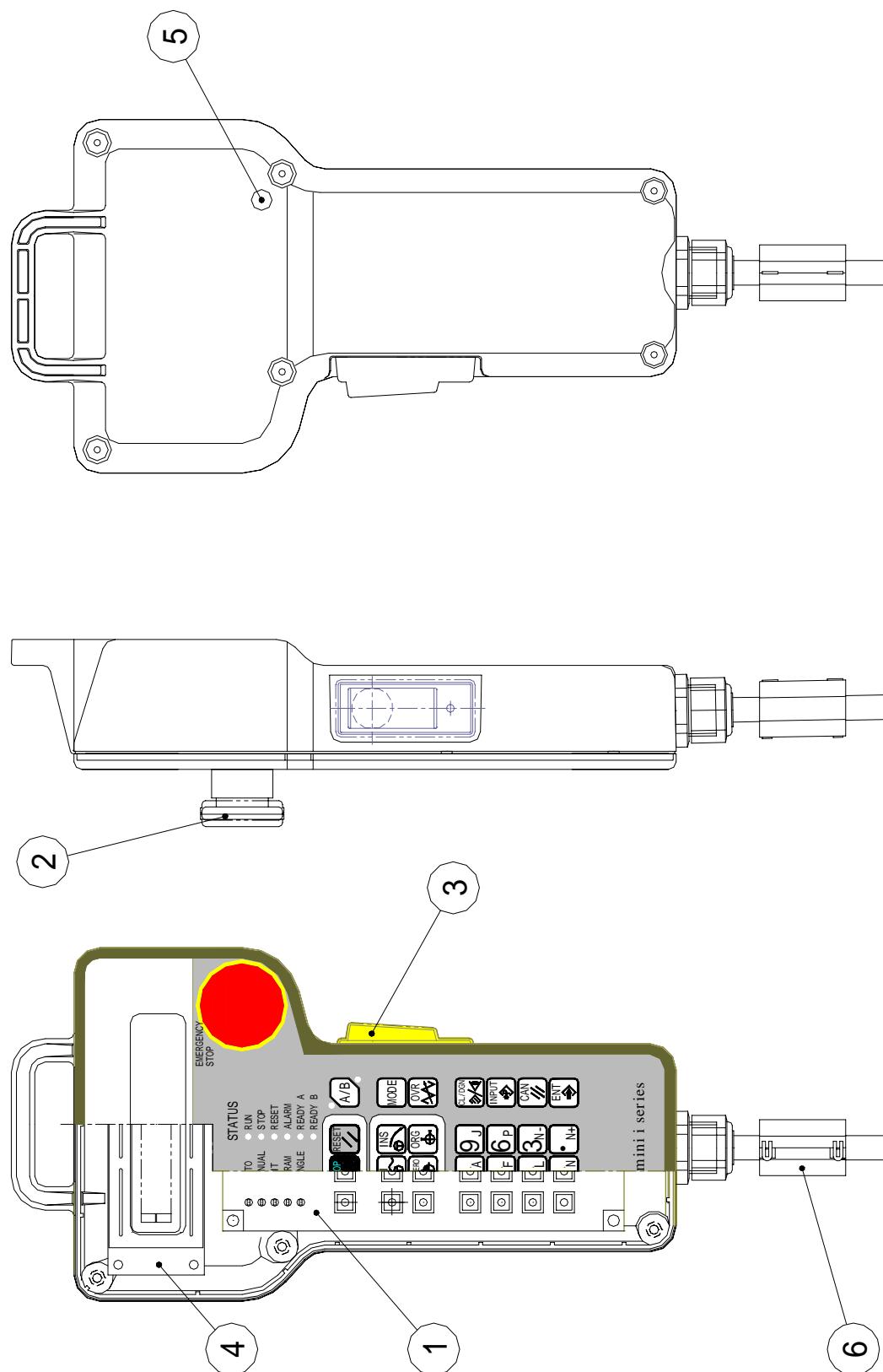
3.2.   Pendant Unit

No.	Code	Parts Name	Type	Maker	Q'ty	Remarks
1	PPB1	Pendant substrate	PB006-H001B	KITAGAWA	1	
2	EPB1	Emergency stop switch	AH165-V5R02	FUJI DENKI	1	
3	ESW1	ENABLE switch	HE3B-M2P	IZUMI DENKI	1	
4	LCD	LCE	PVC200203P	PICVUE	1	
5	CB2-C	Hole plug	HP-8	MISMI	1	
6	F10	Ferrite core	ESD-SR-16	NEC TOKIN	1	